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THE

# INDIAN FORESTER;

## A MONTHLY MAGAZINE

OF

# FORESTRY.

EDITED BY

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THE

# INDIAN FORESTER.

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## PRIVATE FORESTS IN DEHRA DUN.

Very few of the private forests in the Dún have been cut over with any system, the custom being for owners to sell standing trees, or to lease the right of felling on their entire area for a term of years, according to their necessities.

But there is an example in the Eastern Dún in the case of the Lysterpur sál forest, area about 1,030 acres, which was leased for Rs. 12,000 in 1866, only trees up to 8 inches in girth having been spared. Since that date no fellings have been allowed in this forest, and though in common with other private forests in the Dún, its growth has been retarded by the jungle fires, yet it is now densely stocked with poles, and I have heard that the proprietor is looking out for a purchaser for his standing timber at the same price as before. We may, therefore, assume that 20 years is a fair period during which coppice shoots will attain a saleable value, as ballis and tors, though it is probable that this age might be reduced to 15 years if fires were excluded.

Mr. Clifford, Assistant Conservator of Forests, has made some valuations in the sál forest of Lysterpur, with the following results :—

*Countings of Poles in Lysterpur Forest.*

| Number of Poles. | | | Remarks. |
|---|---|---|---|
| (I). Girth from 6″ to 1′ 6″. | (II). Girth from 1′6″ to 2′6″ | (III). Girth over 2′ 6″. | |
| | | | The height of the poles is 45 feet, soil deep and good, with few stones. |
| 160 | 100 | 40 | Average sample of forest. |
| 340 | 140 | 40 | Best sample of forest, scarcely any undergrowth, mostly dead leaves on surface. |

No saplings under 6 inches in girth were counted, and owing to the dense growth of the poles, the undergrowth is, as a rule, kept down by the cover.

The actual value of these poles is easily estimated, as fellings have lately been made in the adjacent private forest of Raynorpur, which before they had thus been thinned, resembled the Lyster forest.

*From each pole of Category I.*

1 Balli can be sold standing at the rate of ... Rs. 3 0 0 per score.

*From a pole of Category II.*

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 Tor, ... | ... | at Rs. | 7 | 0 | 0 | per score. |
| 1 „ ... | ... | „ | 3 | 8 | 0 | „ |
| 1 Balli, ... | ... | „ | 3 | 0 | 0 | „ |
| 1 Korwa, ... | .. | „ | 0 | 4 | 0 | „ |
| Total Rs., | ... | | 13 | 12 | 0 | per score of standing poles. |

*From a pole of Category III.*

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 Karri, ... | ... | at Rs. | 8 | 0 | 0 | per score. |
| 4 Side pieces, | ... | „ | 4 | 0 | 0 | „ 4 score. |
| 1 Tor, ... | ... | „ | 3 | 8 | 0 | „ score. |
| 1 Balli, ... | ... | „ | 3 | 0 | 0 | „ „ |
| 1 Korwa, ... | ... | „ | 0 | 4 | 0 | „ „ |
| Total Rs., | ... | | 18 | 12 | 0 | per score, or trees |

of this class might be sold as ballas in round logs at Rs. 20 per score. This gives the value of the present standing crop per acre for the Lysterpur forest, as follows :—

| | | | | Rs. | A. | P. |
|---|---|---|---|---|---|---|
| (I). | 8 scores, | at Rs. | 3-0 | = 24 | 0 | 0 |
| (II). | 5 „ | „ | 13-12 | = 68 | 12 | 0 |
| (III). | 2 „ | „ | 18-12 | = 37 | 8 | 0 |
| | | | Total Rs., | 130 | 4 | 0 |

As the soil of this forest is very favourable for the growth of sál, it may be as well to place the average value of fairly stocked 20 year old sál poles in the Dún at Rs. 120 per acre every 20 years, which allowing compound interest at 5 per cent., gives an average annual rental of Rs. 4-5 per acre to the owner of the land, and this without the least trouble or expense to himself, as if it be necessary to keep a Chaukidar—and I hear that the owner of Lysterpur has one man on Rs. 6 per mensem, or Rs. 72 per annum, in charge of his forests, or about one anna per acre—this expense can be easily met by the value of the grazing and minor forest produce, such as dead wood, thatching grass, maljhan (fibre of *Bauhinia Vahlii*) for ropes, honey and wax, &c., all of which have a definite value in any part of the Dún.

To show the real value of this land stocked with sál forest,

which in the case of Lysterpur was purchased as encumbered with jungle, for Rs. 5,000 in round numbers, and the standing timber on it sold shortly afterwards for Rs. 12,000 ; an offer of Rs. 75,000 was lately made for it by the Raja of Bukrampur, but the owner is said to have refused to take less than one lakh of rupees.

I think that sál poles will grow as densely in ravine land as in the plains, but the poles will not be so high, and the value might be roughly placed at Rs. 100 per acre every 20 years, yielding an average annual rental of Rs. 3-9-6 per acre, allowing interest as before.

As regards firewood, there is not a single spot in the Dún where its value is not well assured. There is a steady demand for charcoal for Chakráta, Saháranpur and Roorkee, as well as for Mussoorie ; and firewood in large quantities is floated down the Ganges river to Hardwar, and imported into Dehra from every forest within ten miles of the bazaar.

Besides this, the limestone burning in the Tons and its branches in the Western Dún, in the Bindál and Rispana Raos near Dehra, and in all the Raos near the Himalayas in the Eastern Dún, consumes very large quantities of firewood.

After considering all the facts of the case, I have this year fixed the charge for fuel for lime burning at Re. 1 per 100 cubic feet of fuel, the price per cartload of about 10 maunds of fuel for Dehra being 10 annas. In the neighbourhood of Dehra and especially on the hills on either side of the Rajpur road, private sál forests are used for fuel, both for lime kilns and for house consumption, in preference to being allowed to grow up to produce tors and ballis, the forest being cleared every 6 or 8 years ; but I do not think this need affect the question of their value, as the proprietors have only to maintain the forest uncut for 20 years, to get their full benefit as coppice.

The value of the dry wood in the sál forests, as well as that of the minor produce, may also be allowed to go against the cost of maintenance, as it is an exceedingly variable quantity, and the better the quality of the forest, the less of either dead wood or thatching grass will be available.

During the past year I have leased 9 miles of Rao (dry river bed) for the limestone for Rs. 3,000, giving an average of Rs. 333 per mile, but the lessees are reported to have made large profits, and I anticipate an increase next year.

The Bindál Rao, which is zamindari property, has been leased below the Assarori road, for Rs. 250 per mile, but the rate in the Dún of course varies in each Rao according to its breadth, the number and quality of the stones, and the accessibility of fuel.

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*Note.*—Several terms used in the above notes require explanation as follows :—Balli—round log from upper portion of tree, used for rafters. Tor—ditto from lower portion of tree 10 to 12 feet long, used for house posts. Balla, similar to balli, but larger and cut from entire tree Karri—scantling, generally 12′ × 5″ × 4″. Korwa—small sapling used for rafters.

# FORESTRY IN THE UNITED STATES.

To understand the prospects of Forestry in the United States, it must be borne in mind that the land throughout the whole extent of our country, *so far as occupied by settlers*, has become private property, without any reservation whatever. Neither the General Government at Washington, nor the State Governments, own any lands, on which forests are growing, or on which they can be planted, with the exception of now and then a piece so poor as not worth the taxes. The land is then sold for taxes, and if no one bids up to the amount of the claim, it remains State property.

Whatever is done hereafter in the way of cultivating woodlands, must therefore be done by the owners of the land, for no expenses will ever be laid out by Government upon private property.

While we have everything to learn from Europe concerning methods of planting and management, and concerning the applications of science, we can make no use of their *Codes*, nor of their *Jurisprudence*. As the rights of hunting and fishing go with the land, and as we have no privileged classes, all matters relating to these subjects may be left out of our notice altogether. We have a very few large woodlands owned by sporting associations, in which game is protected for the benefit of the associates, but with these the public has no concern. Such a thing as right-of-common, does not exist anywhere, so that we shall at least be for ever free from the vexations attending the administration of these rights.

In short, the problem before us is narrowed down to this—"How can we best induce the land-owners, (mostly farmers cultivating a part of their land,) to take care of their woodlands, and to adopt measures for their restoration?"

It is very probable that we shall ere long begin to realize in advancing prices, the value of woodlands, and from the pressure of *want*, the profits of growing timber. The most that we can do is to advise, and to forewarn, and when we find a willing listener, to teach how and when and where to plant.

We have no Schools of Forestry, and if we had them, the graduates would find themselves without employment, unless they had woodland estates that they could manage.

The question with us, is therefore in a great degree one of diffused and general intelligence upon the subject, among the great mass of our population, rather than of special education of a few. This must be done through State Commissions charged with the collection and dissemination of facts, through the public press—by popular lectures—by premiums in our local Agricultural and Horticultural Societies, and by a certain degree of direct instruction in our *Schools, Academies and Col-*

*leges.* In West Virginia, the State Superintendent of common Schools, has appointed an "*Arbor Day*," to be devoted to the planting of school grounds, and the roadsides. He writes to me that there were about 200 districts last year that followed his advice, and that at least 1,000 will probably do so the coming spring. The greatest benefit from this, will of course be found in the interest which the scholars will retain when they become men, and the owners of land. They will at least have learned the useful lesson, that timber trees are worth planting and taking care of, and a little as to how this can best be done. As we ascend to Schools of higher grade, we should find labelled plantations of trees upon the grounds, and little cabinets illustrating more or less of the subject, and finally in our Colleges, no class should go out without having at least an opportunity of hearing a dozen lectures upon Forestry.

As to the duties of the State and General Governments, I have stated these at length, (as I regard them,) in my Third Report, which I think you have, and to this I refer you.

At the present time, a great deal is being said in the State of New York, about the "Adirondack Wilderness," and the need of its protection. This is a tract of wild broken land too poor for settlement, in Northern New York, and including perhaps 2,000,000 of acres. All attempts to improve it have failed, and the settlers who have tried it have been mostly starved out, and moved away. Of late years large tanneries have been established, using vast quantities of the bark of the Hemlock, (*Isuga canadensis*), and much of the lumber worth having has been cut out, and floated down the rivers to the mills. The effect has been felt in the drying up of streams, and especially such as fed the *Erie Canal.* In 1871, a State Commission was appointed to consider the question of establishing a "Park," or as most people then understood it, a wild waste where parties could camp out, hunt, fish and rusticate in summer. I was one of this Commission, and we found that but 70,000 acres then belonged to the State, the rest having been bought by lumbermen. We advised that no more land should be sold for taxes, and that as it became liable for sale, it should be taken by the State *and held.* This advice was not acted upon until eleven years after: but in 1882 the law was passed. In the meantime the amount owned by the State had increased to 800,000 acres, the timber having been cut off, and the land abandoned as not worth the cost of holding.

There are those now who advocate the purchase of a vast amount, at a cost of ten millions or more of dollars; but it is strongly suspected that this scheme is devised for selfish ends, by those having lands to sell. Others follow my advice, in regarding the step already taken as a good one, but as only the first step; needing a system of forest management to give it effect; but declining to yield to the pressure of speculators.

Some time ago a system of survey of this region was instituted, and we know tolerably well what the region is worth. This value is much below what the owners would like to have it estimated. What legislation may result remains to be seen. Very recently I have stated my views before a committee, and I have already directed that a copy of the pamphlet should be sent to you.

This Adirondack Wilderness is within sight of my door, and its legends and historical associations have a charm that cannot be expressed. I would rejoice in seeing it a well managed forest under State authority, but I very much distrust the motives of some of those who have suddenly become the champions of the measures by which this might be accomplished.

FRANKLIN B. HOUGH.

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## MAHOGANY IN CEYLON.

PARTICULARS regarding some of the largest of the Mahogany trees growing at Jaffna in Ceylon, may be of sufficient interest to find a place in the "Indian Forester."

Jaffna is at the extreme north end of the Island forming a broad peninsula, separating Palk's Bay and the Straits of the Mannaar from the Indian Ocean. The soil is a rich sandy loam of some depth, with water about 10 feet from the surface. The climate is similar to that of the opposite Indian Coast of Madura and Tanjore, although of course more temperate from the proximity of the sea, and from its being fully exposed to both monsoons.

The rainfall is 35 inches, most of which falls in the winter months. There is a long dry hot weather, and the south-west monsoon passes oves this part of the Island without bringing anything more than a slight shower.

The Mahogany trees, of which measurements are given below, are now 40 to 44 years old, and in most instances have fine straight stems, free of branches for the first 14 to 15 feet. At 40 feet from the ground they throw out broad healthy crowns, and being now in very vigorous growth, some fine timber may be looked for in another 40 or 50 years. Some trees have already been cut, and the timber, from which some handsome furniture has been made by Mr. Twynam, the Government Agent, appears to be equal in colour and grain to Central American. Mahogany trees are planted along many of the roads, where they establish themselves readily, and the future of the species in these parts seems fully assured. As yet however the trees seed very seldom, and the largest never bear more than two or three capsules in a season.

*List of Mahogany trees measured in September 1882, at Jaffna, Ceylon; supposed to have been planted between 1840 and 1845.*

| Number of trees. | Average girth at 5 feet from the ground. | Average height to first branch. | Approximate height. |
|---|---|---|---|
| | MAHOGANY TREES IN THE GOVERNMENT AGENT'S COMPOUND. | | |
| | *On left of Circular Road.* | | |
| 8 | 6 feet 9 inches, | 14 feet 7 inches, | 50 to 60 feet. |
| | *On right of Circular Road.* | | |
| 4 | 6 feet 4 inches, | 14 feet 3 inches, | about 60 feet. |
| | *Front of Kachcheri.* | | |
| 6 | 5 feet 6 inches, | 12 feet 10 inches, | about 45 feet. |
| | *Kaddulpallivasal.* | | |
| 1 | 7 feet 10 inches, | 9 feet 8 inches, | about 60 feet. |
| | *Nallur Market.* | | |
| 5 | 7 feet, | 14 feet 1 inch, | about 60 feet. |
| | *In front of Nallur Church.* | | |
| 11 | 6 feet, | 14 feet, | about 60 feet. |
| | *St. Patrick's College.* | | |
| 2 | 7 feet 2 inches, | 13 feet, | about 50 feet. |
| | *In front of District Court.* | | |
| 1 | 7 feet 8 inches, | 12 feet 4 inches, | about 40 feet. |
| 38 | Trees. | | |

F. D'A. V.

## SHIKAR INCIDENT.

THE following shikar incident took place a few days ago near Meinhully in North Kanara, and as the facts are still fresh in my memory, and may interest some of the readers of the "Indian Forester," I shall tell as well as I can what occurred.

About half-past two in the afternoon as I was returning home from an unsuccessful day's Sambhur stalking, and at about a mile from camp, I was suddenly surprised to see a tiger spring high in the air; I was not more than 80 or 90 yards distant from him at the time.

At the same moment the monkeys on the tree, where I afterwards found the marks of the tiger's claws, began to call and to make great bounds from branch to branch.

Evidently they had not seen the tiger, who was no doubt there intent on getting hold of one of them. I distinctly saw him in his spring, and the fore legs were doubled close under his body, and were not, as is usually represented in pictures of tigers springing, straight out.

I did not see him alight on the tree or how he subsequently got to the ground; but there he was for an instant, as if suspended in the air.

After I realized the situation I caught hold of my eight bore from the Shikari who was close behind, giving him at the same time my express which I was carrying, and I ran forward.

There he was, standing about 30 yards off in the long grass, and evidently surprised at the sound of my coming, which he probably heard.

Before he had time to see me distinctly or to make out what I was I fired at him; an easy shot, as I could just see his yellow body and head through the grass. Before I could see to fire a second shot, he had disappeared without making a sound, and when I went up to the place where he had been standing, I could not find a drop of blood.

This surprised me a good deal as I could not believe I had missed him.

All round near where he had been standing were numerous paths made in the long grass, either by the tiger or some other animal, and it was like looking for a needle in a haystack to try and find him; so after half an hour's fruitless search, I went on to camp, rather depressed to relate my luck to another Forest officer who was there waiting for me.

Next night, I had changed camp in the meanwhile to another village, I was awoke by the rumbling of a cart coming towards my tent, and hearing an animated discussion amongst the servants, and catching the words Meinhully and bagh, I jumped up, and was joyfully surprised to see my tiger with his head towards me, tied on a timber cart. He had been shot clean through the heart, the bullet passing out on the opposite side.

A shell or express shot would have probably got him, if hit in the same place, at once; as it was he went about sixty yards without making a sound, before he fell dead on a pathway, where he was found on the following day by a villager going through the forest to Meinhully; he measured nine feet one inch.

Tigers shot through the heart often make no sound after

being hit. It is very rare to see a tiger in his spring, and it was very unlucky not to get a drop of blood after having hit him so well.

FORESTIER.

## FOSSILS IN KALUWALA PASS, SIWALIKS.

WHILE making enquiries regarding the torrents which endanger the Eastern Jumna Canal, I took every opportunity of endeavouring to ascertain the whereabouts of Captain Cautley's fossil bed in the Kaluwala pass, and was fortunate enough to meet one of the men who, as I understood him, was present when Captain Cautley discovered the fossils. This man, a canal Chaukidar, described the place to me, and in company with Messrs. Oldham and Middlemiss of the Geological Survey, I made a careful examination of the locality. After searching for sometime, and breaking up the rock, we discovered portions of fossil bones, but not in any considerable quantity. Mr. Oldham is going to describe the locality in the next number of the Records of the Geological Survey, so I need say little more about it.

The 'clay conglomerate' in which these bones are embedded is found close to the head of the Kaluwala bund, and the small spur higher up on the opposite side of the Rao.

This is undoubtedly the bed whence Captain Cautley extracted the fossils which were afterwards lost in the British Museum; it is not the bed, nor the locality, where the great mass of Siwalik fossils was found, which was on the other side of the Jumna.

A. SMYTHIES,
*Deputy Conservator, Saharanpur Division.*

## HIMALAYAN SEEDS FOR THE CAPE.

TO THE EDITOR, "INDIAN FORESTER."

SIR,—With reference to Mr. Hutchin's article on "Himalayan Seeds for the Cape" in the December Number of the "Indian Forester," it may interest some of your readers to learn that two unsuccessful attempts to send about 5 lbs. of Deodar and Chil (*Pinus excelsa*) seed have been made, but owing to some defects in the Postal arrangement these efforts have proved a failure, the Post office having in the first place failed to transport them further than Bombay, and in the second place an attempt having been made through Messrs. Grindlay, Groom and Co., that firm agreed to deliver them by some circuitous route on consideration of the moderate payment of Rs. 25, at the rate of Rs. 5 per lb., which charge may be considered prohibitory.

E. McA. M.

TO THE EDITOR, "INDIAN FORESTER."

SIR,—Can you or any other reader of the "Indian Forester" oblige me by defining the term "Ministerial officer" as used in Section 31, Exception 1, Page 17, of the Civil Travelling Allowance Code.

Are the subordinate forest officers, such as Forest Rangers, &c., considered Ministerial officers?*

Yours faithfully,
A TRAVELLER.

---

## LARGE TREES.

SIR,—I measured lately two trees, *Azadirachta indica* (Hind., *Nim;* Telugu *Vepa*), that were growing in a tope facing a temple.

The smallest was 14 feet in circumference on the ground, and 10 feet 9 inches at 3 feet high. The other was 17 feet 6 inches and 12 feet girth at 3 feet above ground. I have never seen larger trees of this variety, and would be glad if any of your numerous readers would give the measurements of any nim trees larger than the above. The trees were healthy and showed no signs of decay; the leaves appeared to me of a darker green than the general hue of nim trees.

The tope is prettily situated on the northernmost bend of the Kistna river at a zemindary village called Mukthiyala.

CASTELNAU.

*9th February, 1884.* —*Asian.*

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* Ministerial officers are defined in the Civil Pension Code, page x, "Definitions," to be as follows:—

"Ministerial officers means an officer, whether his appointment to the service is "gazetted or not, whose duties are not of an administrative or executive charac-"ter, but who is employed as a member of an office establishment. *Examples*:— "A Registrar, an Accountant, or a Clerk is a Ministerial officer. A Tahsildar, "a Police Inspector or Constable, or a Teacher in a School is not a Ministerial "officer. (Government of India, Financial Department, No. 3359, dated 30th "September, 1881)."

Forest Rangers, &c., are not Ministerial officers.—[ED.]

# II. Reviews.

## THE GRAZING DIFFICULTY IN THE PUNJAB FORESTS.

In reviewing the Punjab Forest Report for 1881-82 the Government of India remarked upon the small area closed against grazing, and expressed a hope that it would be found possible to increase this area, as, otherwise, in a dry climate like that of the Punjab, forest conservancy was unlikely to be successful.

The first fruit of this Resolution has now appeared in the form of a "Memorandum on Grazing in Government Forests and Waste Lands," by Mr. Ribbentrop the Conservator of Forests in the Punjab.

The grazing question presents greater difficulties, and is more closely linked with forest management in the Punjab than, perhaps, in any other part of India. Cattle constitute half the wealth of ninety-nine per cent. of the population. The immense flocks and herds are, however, almost entirely dependant on the spontaneous growth of the waste lands for their support; their owners have neither the land, the capital nor the enterprise to grow forage for them. In the plains, during the hot weather months, the scorching hot winds convert the natural grazing grounds into deserts, and it is only in the forests and where the soil is protected by trees and the detritus that accumulates under them that any green thing is to be found. The scanty pasture obtained from these woodlands, assisted by chopped leaves and roots and whatever forage is to be had from the irrigated fields, barely suffices to keep the animals from dying of starvation; in good years they survive, in bad years, years of long drought, the weakly ones die off.

Unrestricted grazing is destroying the trees which furnish and shelter this hot weather pasture, and the cattle driven up from the lower hills during the dry months threaten to destroy the hill forests, from which the entire supply of building timber for the province is derived. But it would jeopardize half the wealth of the country to close all these areas at once to grazing. It is therefore necessary to devise a system of forest management which will preserve both the forests and the cattle in the proportion most beneficial to the people. The prosperity of the province to a great extent depends on the solution of this delicate and difficult problem; and although, as Mr. Ribbentrop states,

the information collected is still very incomplete, a report dealing with this subject cannot fail to contain much matter of general interest.

Mr. Ribbentrop assumes it admitted that "a fair forest reproduction in its earlier stages is impossible in a grazed forest, and that camels, goats, sheep and buffaloes are a source of great danger and damage to forests even after reproduction is otherwise secured and fairly advanced." He does not therefore think it necessary to cite "Darwin's experiments regarding sheep grazing, or those of Hooker on the destruction of the vegetation of Centralina by goats, and other scientific and historical proofs," but proceeds at once to discuss the question before him. This he considers to be—"What area of the uncultivated lands in the Punjab still at the disposal of Government ought to be closed for the reproduction of forest vegetation, and as fodder reserves, so as to benefit the country and its population to the greatest possible extent." In discussing this question the points to be specially considered in each case are "the possibility of afforestation, the direct and commercial profits that will accrue therefrom, and the indirect benefits, especially with reference to agriculture which must follow, but on the other hand, it must be weighed how the closing against grazing affects the rights and customs of the people, and whether the public wealth of the country is improved or diminished by such enclosure, and finally, what system of management would be most profitable to the public and most convenient to those directly interested."

It is evident that, in a province like the Punjab, extending from the regions of eternal snow to the desert, and with a climate varying from moist to arid, the same arguments will not apply to all localities. For the purposes of the report the waste lands are therefore classified by Mr. Ribbentrop, as follows :—

Alpine grounds occupying the higher regions of the Himalayas.

Lower hills, Sewaliks and other ranges. Plains, locally known as "Bár" lands.

Sailaba or lands naturally fertilized by percolation from the rivers.

The alpine forests are situated in Khagan, Kulu, Bashahr and Chamba, and occupy the drainage of the upper portions of the Kunhar, Beas, Sutlej, Ravi and Chenab Rivers, by which their produce is exported to the plains. The total area of the forest land situated in these regions is estimated at 1,000 square miles, of which up to the present 446 square miles have been reserved. Only 145 square miles of this area have however been closed to grazing.

The grazing in these regions may be divided into three classes—summer, winter, and permanent. The summer pastures are above the forests, and are generally in excess of present require-

ments. But a large number of the animals grazed have to be driven to the lower hills or plains for the winter. There is sometimes a hard struggle to winter those that remain, and in the early spring, while the upper pastures are still covered with snow and winter supplies have been consumed, it often happens that it is only from the forests that a supply of fodder can be obtained. In some cases the flocks or herds do not migrate for the winter, but are stall fed or grazed on the limits of the upper forests, and fed with loppings of oak, mulberry, &c. In such cases the lower slopes of the hills are often burned during the spring to produce an immediate crop of grass.

The reasons for reserving the alpine forests are not so much climatic as economic. The climate of the country at large is but slightly affected by the forests in these elevated regions. The moisture brought from the sea by the south-west winds must be precipitated as rain before these air currents pass over the high ranges of the Himalayas, whether these are forest clad or not. But as the entire supply of building timber for the province, and countries beyond it, is derived from these forests, the importance of their reservation, both directly and indirectly, cannot be over-estimated. The claims of the population of this large area is evidently more deserving of consideration than those of the comparatively few who happen to live near the forests, or who graze their cattle in them, and to meet their claims it will be necessary to work the alpine forests so as to obtain the greatest possible amount of building timber they are capable of yielding. At present the demand for deodar and other building timber is partly met by the supply from the Kashmir forests. But this source of supply cannot be calculated on for long; worked as they are said to be at present, the exhaustion of the Kashmir forests is merely a matter of time. The area capable of producing large timber, especially deodar, in the hills will, probably, be found too small, even under the most careful management, to meet the demand for building timber, and it is therefore absolutely necessary to exclude grazing and all other causes of diminished production.

The difficulty is how to provide during the winter months for the animals at present grazed in or fed from the forests.

Mr. Ribbentrop is, however, "convinced that it would be quite as feasible in the Himalayas, as it is in Switzerland and elsewhere, to winter and stall feed the cattle and sheep until the open alpine pastures offer their rich summer grazing; but this can only be done by systematically making and storing hay, and this the natives will not do as yet. Whenever hay is collected by natives the grass is cut when it has seeded and ripened and silicified, and it is only stored just in sufficient quantities to prevent the cattle from starving."

The principal lower hill areas are situated in the Hazara and Murree Hills (which, with the higher Alps already described,

contain the only timber forests still existing in the Punjab), the Salt Range, the Pabbi Range and the Hoshiarpur Hills. A great portion of the lower hill area, the drainage of which affects the underlying districts, is however situated in Kashmir and other foreign States. The area of the waste land in the lower hills cannot at present be accurately estimated; but 1,055 square miles, of which 559 square miles are free of grazing rights, are under the management of the Forest Department, and of this area 531 square miles, of which 260 square miles are closed to grazing, are already reserved under the Forest Act.

The present state of the waste lands and reserved areas in the lower hills, and the steps that should be taken to improve them, are described by Mr. Ribbentrop as follows :—

"The lower hills are probably the most important forest areas in the Province, and, if well wooded, their influence on the agricultural wealth of the underlying country would be considerable; but from the Peshawar frontier to the Kalesar Dún we find, with few exceptions, *over-grazed, almost barren, hill sides cut up by steep ravines forming torrents while the rain lasts and almost dry immediately afterwards.*" * * * * * * * *

"The low hills of the Rawalpindi and Jhelum Districts, and all others underlying the Himalayas, were by nature intended to be largely covered with forests, and no doubt were so at one time. Their barren character is not due to their geographical position, but to the action of nomadic tribes. The formation of the surface of parts of the Rawalpindi Districts, the Pabbi and other places I have visited, prove that the denudation of the hill sides is comparatively modern, for the undulating formation is still clearly discernible, and, though cut up by ravines, the traces of their former shape have not been entirely destroyed in spite of a heavy rainfall and steep gradients. The present aspect of a section of the surface is like *Fig.* 1;—whereas had it always been barren it would be like *Fig.* 2.

That the Hoshiarpur 'chos,' only recently deforested, are mostly peaked, as shown in the second illustration, is due to the extremely friable character of the sandstones of which they are composed.

"As regards the northern districts of the Punjab, I have seen it quoted that, even within the historic age of Alexander the Great's time, these hills were densely wooded, and a few of the rakhs, such as Drengan and Parera, which in the days of the Sikh rule were carefully preserved for the sake of game, prove that the Salt Range can even now produce a fair forest growth. It is bad enough that we find devastated areas on natural forest land, for nature punishes only too certainly the sins of the fathers on the children in several generations, and re-afforestation of these hills will be ex-

tremely tedious or expensive; still it is our duty to begin the improvement, and we have no right to encourage the nomadic habits of the people, in localities which can support a higher state of existence, farther than private rights compel us. It is no idle writing, that nature demands that a considerable percentage of land which by its geographical position and physical qualities is naturally forest clad, must remain under forest. I can quote numerous examples where disobedience to these orders has been followed by disastrous consequences.

"The destruction of forests in Spain some two hundred years before Christ has, in spite of the richness of the soil, retarded and prevented its developement as an agricultural and consequently civilized country; the Tyrol lost in one century a third of its cultivated land by the destruction of forests, and is only now slowly recovering both; sterile pastures were created in the countries of Osnabrück and West Holstein in Germany by the destruction of forest made over to the free management of village communities before communal forest laws were made sufficiently stringent; forests together with cultivation are still drawn back year by year in the south of Russia and Hungary, and the devastation of forests in the Bavarian highlands ruined, first vine growing, then agriculture, and finally grazing itself."

"I could quote numerous other facts, but we have the most glaring examples under our very eyes in every sub-Himalayan district in the Province. We need only look at the broad sandy beds of the torrents debouching from the Salt Range, the *chos* and the hills in the Umballa district, feeding so to say, on rich culturable land, destroying the field and grass grounds in those hill ranges themselves, and covering the underlying fields with sand and gravel."

* * * * * * *

"It would be comparatively easy to double or treble the grass supply of the lower hills, even of those not set apart for treatment as forests, by digging short trenches of one foot depth in the *exact* contour lines of the hill sides at 4 to 12 feet apart according to the steepness of the slope. The steeper the slope the nearer should be trenches. If this work is well and systematically carried out, the water cannot, as at present, rush down the steep hill sides, but is caught in the trenches, percolates the ground and causes a rich crop of grass to spring up. Where the ground is once properly trenched it is not difficult to keep the system of ditches in repair, but of course the area cannot be grazed over, as this would lead to a destruction of the trenches." * * * * * *

"That the scheme is practicable and the result a doubled or trebled outturn of grass, can be seen any day at the Pabbi; and I would recommend this system to all District officers."

Mr. Ribbentrop proposes to increase the area closed to grazing in order to make similar improvements, and reviews the circumstances of each forest separately district by district. But the mistaken system of forest management adopted by Government stands in the way of this.

"The orders stand that the reserved rakhs must be managed with due regard for the requirements and convenience of the surrounding

villages, and under *requirements* I am sorry to say, the requirements of a nomad are still understood, and, by *convenience*, as much unrestricted pasture ground as possible, without interfering with other private rights. We are wrong here, for the public in general have most important rights in such situations, rights which ought to outweigh those of the few living in the immediate neighbourhood."

No one who reads the exhaustive correspondence regarding forest settlements in the Punjab, or who examines the settlement records of the reserved areas, can fail being struck with the minute attention which the authorities have given to forest settlements, and the infinite pains with which the Settlement officers have considered the claims, the customs and the wants of the people. But unfortunately the officers charged with the settlement of the claims in the forest reserves have not always possessed a practical knowledge of the methods by which forest lands are improved, or of the conditions under which it would be difficult or impossible to employ these methods, nor have they sufficiently appreciated the idea of the national importance of forests and of the claims which the general public have on them, to be able to overcome their very natural sympathy with the few whose immediate interests were threatened. Consequently an unnecessarily liberal view has been taken of the claims put forward, and even where these claims have not been admitted, minor and apparently harmless rights have frequently been allowed, under cloak of which protective measures are baffled in actual practice.*

Although the system of forest management devised by the settlement authorities was intended to reconcile the conflicting interests (as they are very erroneously called) of the people and of forest conservancy, and meet the fair claims of both, the method of treatment adopted for the forests does not lead to this or to any other definite result. The State interferes in the management of forest lands either on physical grounds, to prevent landslips and so forth, or in order to secure for the community, or for some section of the community, the most useful products the land is capable of yielding. In the former case grazing would, necessarily, be excluded, or at least very strictly regulated; in the latter case, even where forage was the most useful product the land was capable of yielding, as we shall see is the case in the Bár, grazing would still have to be regulated so as to allow a method of treatment that would secure the maximum amount of forage at the time it was most wanted. It is not easy to understand with which of these objects the present system was devised; for it attempts nothing beyond the protection afforded by a guard armed with the legal powers conferred by a notification under the Forest Act. The

* Some notable exceptions are to be found in the Pind Dadan Khan Tehsil of the Jhelum District.

existing forests are not preserved nor are others created, for although the trees may not be removed bodily, still, as reproduction is impossible, their extinction is merely a matter of time.

Nor do the lands managed produce the maximum amount of useful products they are capable of yielding; on the contrary they are so over-grazed that it requires from one to five acres to support a single head of cattle, and unrestricted grazing is destroying the trees that furnish or shelter their most useful product, hot weather forage. Apart from the mischief done to the wooded lands, the right to graze unrestrictedly over *all* the waste area is an evil for the population which enjoys this right. The largest stock the land can support in ordinary years is produced. As the quality of the grazing deteriorates and the supply falls off, the cattle have to seek their food over a larger area, and, as a consequence, a greater number of inferior animals, goats and sheep (the great enemies of the forests) are bred. This stock, ill fed at all times, and more than half starved during each recurring hot weather, produces a feeble off-spring, which is unable to survive years of exceptional scarcity, and which consumes what would serve to support a less number of more valuable animals.

It would have been no impossible task to have devised a system of management by which every acre of the waste lands under the control of Government in the lower hills would, in time, become covered with jungle, which, while protecting the hill sides, and regulating the water flow, would supply the wants of the agricultural population in fuel and grass. Even closing to grazing a certain percentage of *every* waste area for nine months of the year until the hot weather, would prevent the cattle being annually starved, as they are at present, and so increase the wealth of the province. But even this improvement is impossible under the existing system.

It follows then as the result of the system devised, that the customs of the people and their privileges in such matters as the felling of green trees, &c., are interfered with to no purpose, and an expenditure is incurred on an establishment for the protection of lands from which, under the present system, no benefit is, or ever can be, derived.

The area of uncultivated *Bár* in the plains of the Punjab is estimated to be 23,537 square miles. Of this 12,276 square miles is still the property of Government, and preserved for grazing or forest reserves, 10,340 square miles being managed by the District officers, and 1,936 square miles by the Forest Department. Of this area only 109 square miles are entirely closed against grazing, while 155 square miles are closed to camels, goats and sheep. 257 square miles, of which 48 miles are entirely closed, and 59 square miles partially closed, have been declared reserved under the Forest Act, only 88 square miles of the reserved area are however burdened with grazing

*rights.* Mr. Ribbentrop discusses separately the waste lands in each District, and gives detailed lists of the villages which resort to the Forest Department lands for grazing, the number of cattle they possess, and the area of the village waste. It is not proposed, as in the case of the lower hills, to attempt the afforestation of these Bár lands except in exceptional cases; without artificial irrigation this would be impossible; but simply to control the grazing so as to prevent over-grazing and allow fodder reserves being formed for the hot weather and for years of exceptional drought.

"The greater portion of the waste land in the Punjab Bárs is for grazing, probably the most important and of the least use under forests, either with regard to producing fuel or timber, or for climatical or other physical reasons. Exceptions to this are rakhs with water sufficiently near the surface, or subject to a rainfall seasonable and copious enough, to admit of artificial reproduction; such rakhs in which kikar trees will grow without artificial watering; and also all rakh lands within reach of canal irrigation. These rakhs, if not required for permanent cultivation, should be treated as much for their forest growth as for their grass supply. The greater portion, however, of the Punjab Bár rakhs, the vast extent of country in the Jhang, Montgomery, Mooltan, and other southern districts of this province have, in my opinion, always been clothed with a forest of a similar character to what they now bear, and are by their geographical position, the permeability and depth of their soil, and their general formation, intended for grazing areas, and should be treated as such. By such treatment I do not, however, mean that they should be thrown open to indiscriminate grazing and over-grazing, as may be gathered from the following paragraphs:—

"The rakhs in the Punjab Bárs are sparsely wooded with jhand, reru, pilu, and karil, interspersed with bushes of mulla (*Z. nummularia*) or phok, (*Calligonum polygonoides*,) shading off into farásh and kikar where either proximity of water to the surface or occasional overflow encourages the growth of these trees, and gradually fading towards the south into demi-desert.

"All trees produced on the Bár land have an extremely long tap-root, which they send far down in search of moisture, and consequently they coppice well. With regard, however, to their natural reproduction by seed, I am sorry to say I know extremely little, and I can find nobody who has made this question a matter of special study and research, without which it cannot be solved; and, till it is solved, all our theories regarding the original establishment and possible developement of the forest growth are of a speculative character.

"I have now issued instructions for practical experiments which will probably have to extend over many years, but which finally must result in our obtaining the knowledge required.

"I confess that we know extremely little with regard to the natural reproduction of Bár rakhs, but we certainly know that no satisfactory result can be obtained, either from coppice or new germination, without total exclusion of all grazing. It is, again, a matter of recorded observation that the Bár trees at a certain time

of their life get scrubby and deteriorate, but start with fresh vigour when cut back to the stool. It is also well known that the grazing is very much improved by forest growth in proportion to its density, and that, not only in times of scarcity but in ordinary years, cattle, sheep, and goats live, to a great extent, on leaves of forest trees and bushes. It is for these reasons necessary to fell the trees in the Bár rakhs from time to time, and then to close these areas for reproduction.

"The Government of India in their Circular No. 16A, dated 1st March, 1883, recommend the formation of fodder reserves, and this is nowhere more required than in rakh lands of the Punjab Bár. By grazing reserves, however, I do not understand that as large an area as possible should be set apart for grazing, perhaps at a cost of the extension of permanent cultivation; but I would recommend that the cattle of each district be reduced to or kept at a number which, in ordinary years, would find, under proper management, a sufficiency of food in the rakh lands outside such reserves. In my opinion, ten per cent. at least of all rakh lands should be entirely closed against grazing, and should only be opened during the months of March, April, May, and June. If in ordinary years, the cattle of a district do not find sufficient food during eight months of the year on seventy per cent. of the grazing grounds, and throughout the year on ninety per cent., it seems proved that the district is overcrowded by cattle, an occurrence which has repeated itself amongst nomadic tribes since the days of Lot, and which must end in famine, disease, or emigration. The wretched condition of the cattle, in the rakhs of the Montgomery district I have re-visited, seems to indicate that the grazing grounds are overcrowded, and the grass-lands themselves are in a much worse state than they were twelve years ago.

"The areas closed for reproduction of forest growth should be in addition to those I now propose to close for fodder reserves.

"Much can be done to increase the grass growth in Bár lands by digging small trenches some 6 to 12 feet apart, vertical to the slope of the country, to collect the moisture; an experiment made to this effect in Chichranwali in the Gujranwalla Division, and Kot Lakhpat in the Lahore Division, shows that the grass-producing power of the ground is much improved thereby. Of course, these areas cannot be grazed over, or the trenches will be destroyed, as may be seen from the areas thus treated in the Muhammadpur reserve in the Montgomery District, where a closed area lies side by side with one subsequently opened."

The grazing in these areas, as in other waste lands in the Punjab, is generally leased annually, the leases being either sold by auction to the highest bidder, or given at the fair market rate to influential zamindars selected by the Deputy Commissioner from the residents in the neighbourhood of the land of which the grazing is leased. Mr. Ribbentrop objects to this system, as it is the lessees interest to collect as many animals as possible (for each of which he, of course, receives a fee from the owner), and so over-graze the land, and recommends instead that a certain rate, according to the kind of

animal grazed, should be charged monthly for each animal, or that a limited number of animals should be admitted to each grazing ground on payment by regular instalments of certain fixed fees.

As has been already stated, a portion only of the grazing grounds are managed by the Forest Department, the remainder being in the charge of the District officers. Mr. Ribbentrop objects strongly to this dual management by which "all attempts to administer the grazing and forest areas to the greatest advantage of the State and people are made difficult."

In the Inspector General's review of the Provincial Forest Reports for 1881-82, a hope was expressed that it would soon be possible to remove this obstruction to the progress of forest administration, and the scheme is now before Government. So long as Forest officers do not form part and parcel of the District administration, Government is pulling down with one hand what it tries to build up with the other. In no province in India does forest work affect the people so much as in the Punjab, and consequently in no province is it so necessary that Forest officers should work hand in hand with the District and Revenue officers. Working as assistants to the District officers, (*de facto* and not merely *de jure* as has happened in some cases where this change in organization has been attempted,) the services of Forest officers might often be utilized in advising on questions of district arboriculture, and much might be done in this way to facilitate the greater work of the department by rendering forest work more popular than it is at present in the Punjab.

*Sailaba* lands are naturally fertilized by river percolations, and are consequently independent of irrigation. The chief Sailaba areas are found in the Muzaffargarh and Lahore Districts. The total Sailaba waste still belonging to Government is estimated at 224 square miles, of which 155 square miles are managed by the Forest Department, and 69 square miles by the District authorities. The grass supply in these areas is naturally much more constant and abundant than in the Bár lands, and the villages are rarely hard pressed for grazing. Most of the Sailaba areas under the Forest Department are covered with plantations, and it is stated that the closing of these areas would not interfere with the rights of the inhabitants or cause them any appreciate hardship. It is therefore proposed to keep these areas as reserves, to be opened only in the hot weather months when there is no grazing to be had in the drier lands.

It will be seen that Mr. Ribbentrop proposes three sorts of exploitability for the three great classes of lands—alpine regions, lower hills, and plains, considered in his report.

*Economic exploitability* for the alpine forests.

*Physical exploitability*, modified in some cases from a regard

for the wants and customs of the population in the neighbourhood for the lower hills.

*Pastural exploitability*, (if the expression may be used,) for the waste areas in the plains exploited by means of pasturage, in which the tree growth is utilized as forage, and to protect the soil and the herbaceous growth underneath.

The mode of treatment that would be adopted in the latter case might to a great extent be carried out by the people themselves if the *Lambadars* were placed under the orders of the Forest officers, and paid a small commission for managing the grazing grounds under their supervision in the manner *Mauzadars* are employed in Assam as explained in the Chief Commissioner's resolution on the last forest report for Assam. Without some such arrangement the proposed system of management would probably be found to require a larger subordinate protective establishment than it would be possible to entertain, particularly as it will necessitate the sacrifice of a large part of the present grazing revenue and a considerable expenditure on reboisement and felling.

Mr. Ribbentrop's proposals are thus summarized :—

"My proposals take it for granted that forest reproduction cannot be ensured if the area is grazed over, and may thus be summarized. In alpine grounds grazing should be excluded from an area sufficiently large to insure the reproduction of the timber and firewood required by the local and export market, and in special cases for the protection of villages, roads and cultivation against landslip, snow-drifts, &c. General climatic reasons need not be considered. In the lower hills the climate is seriously affected by deforestation, and the damage done is not only local, as in the higher hills, but affects the whole underlying country. In these localities it is our duty to exclude grazing from as large an area as possible, and to acquire a right of interference to this effect on areas which have been alienated in the course of former settlements. In the Bár lands it will suffice to close for reproduction such areas as have been cut over, but extensive fodder reserves should be created in each of the large grazing districts, part of which should be opened during the annually recurring scarcity of grass, and a certain amount should be thrown open only in very exceptional years. These areas should be managed by a direct 'amáni' system in small and compact 'chaks,' and on payment of a monthly 'tirni.' In these areas a more secure advantage should be given to well cattle than a simple reduction of the tirni fee. On Sailaba lands no special measures are required."

It is to be hoped that these proposals will be adopted by the Local Government, for it is evident from Mr. Ribbentrop's report that the system of forest mismanagement which has been forced on the Forest Department, and is with some exceptions carried on throughout the plains of the Punjab, can bear no fruit, while it discredits Government, injures the people and benefits nobody.

W. E. D'A.

## DUTHIE AND FULLER'S *FIELD AND GARDEN CROPS.**

MESSRS. Duthie and Fuller are to be congratulated on their book on the Field and Garden Crops of the North-Western Provinces and Oudh. A real want is supplied by this work, of which the object is to give an accurate and comprehensive view of the agriculture of these Provinces. The book is in two volumes, and contains most excellent illustrations, the work of Mr. H. Hormusji, a Parsee Artist, who is said in the Preface to have been "imported" from Bombay, as though he were a ream of drawing-paper or a gross of pencils, instead of being an artist of no mean skill. For the greater part of the subject matter Mr. Fuller is responsible, but although the fact cannot be fully gathered from Mr. Benett's Preface to the "Field and Garden Crops," Mr. Duthie has supplied not only the botanical notices at the head of each chapter, but also has selected and collected the plant specimens, from which the drawings were made by Mr. Hormusji, and has written an explanation of each of the Plates. The praise due for producing a work of so much interest and so full of information may, therefore, be fairly divided between the authors, and Mr. Hormusji, whose drawings obtained a gold medal in the Amsterdam Exhibition, and who has beautifully hand-colored several sets of the plates, deserves our warmest thanks for giving life to the subject matter. The Introduction, which covers 21 closely printed pages, is a valuable abstract of the leading facts connected with the agriculture of the North-West Provinces and Oudh. The area of land, the population, and the land revenue are compared; and it is shown that the average size of individual holdings decreases strikingly from East to West. The proportion too of rural to urban population is noticed and commented on. The seasons and their various crops are described with much clearness; and detailed descriptions are given of the various kinds of soil and of the manures used by the cultivator. In commenting on the methods of tillage, Mr. Fuller makes the very true remark that the condemnation passed on them is as a rule far too sweeping. It is shown how the inefficiency of the native implements is made up by the patient industry and perseverance of the cultivator. Although the plough is a mere scratcher of the soil, and the cattle are generally weak, the twelve or fourteen ploughings usually given for the more valuable crops make a tilth of depth and fineness not often attained in an English market garden. The plough is lightest and worst in the Eastern districts and in Oudh, where it weighs sometimes not more than 17 or 18 lbs. In the Western Districts of the Doáb the plough is far more

* Field and Garden Crops of the North-Western Provinces and Oudh, with Illustrations. By J. F. Duthie and J. B. Fuller. Roorkee 1883.

efficient, weighing from 40 to 50 lbs.; and in this part too the cattle are the finest in the Provinces. An interesting table is given on page xiii showing the statistics of irrigation. The total irrigated area is one-fourth of the whole area under cultivation; but whereas in the Jhansi and Benares Divisions the area irrigated from canals is almost nil, in the Meerut Division it amounts to 50 per cent. of the whole. Wells form by far the largest source of irrigation, the area irrigated from them being more than twice that irrigated from canals. A single well bucket will irrigate from ⅛th to ⅙th acre in a day. The Persian wheel is only found in two small tracts; but the lever lift (*dhenkli*) is a common and efficient means of irrigation, costing about Rs. 2, and capable of watering ⅛th acre daily from a depth of 10 feet. Tanks are mostly used in the Benares Division, where the soil is tenacious and the rainfall heavy. The cost of irrigation differs greatly according to the method used. A day's irrigation by means of a *dhenkli* costs Rs. 6-8 and covers ⅛th acre; from a pucka well a day's irrigation costs Rs. 9-13-0 and covers ⅕th acre; while from a canal 3 acres can be irrigated in a day at a cost of Rs. 3. The value of canal water however is much discounted by the uncertainty of its supply, which can only be legally taken at certain fixed periods. Timely irrigation is of the highest importance, and therefore wells are often used in preference to canal water even when the latter is close at hand. "The difference between the cost of canal and well water may be taken as the measure of loss which the cultivator thinks it possible he may suffer from the supply not being timed to suit his crops" (p. xix). Another subject of much importance is the size of individual holdings. The average size of farms varies from 8·6 acres to 3 acres, and the holdings being so small the cultivator has to depend largely upon home labour. The cost of cultivation is consequently difficult of determination; for even if the home labour be valued at the market rate it is impossible to appraise exactly the care and attention devoted by an industrious family out of ordinary working hours. Mr. Fuller however states that the following figures showing the cost of various agricultural operations for one acre of land may be taken as approximately correct:—Ploughing 12 annas, harrowing 2 annas, sowing 12 or 14 annas, weeding 12 annas to Re. 1-8, watching 12 annas, threshing Rs. 3.

So far for the Introduction. We now have to glance at the Crop Notices which form the bulk of the work under review. A separate chapter adequately and carefully illustrated is devoted to each kind of crop, the principal crops being treated of in Vol. I., and those of less importance in Vol. II. The chapters of course vary considerably in length, but in all, the same arrangement of subject matter is followed, a method which greatly facilitates reference, and is in strong contrast to the haphazard

paragraphs of Pogson's *Manual of Agriculture*, a work which we noticed a few months ago. Each chapter of Messrs. Fuller and Duthie's book begins with a detailed botanical description of the plant in question, which is followed by an enumeration of the varieties known to exist. Next is shown the distribution of the crop over the various parts of the Provinces, and the other crops are mentioned with which it is usually mixed. To these succeeds full information regarding the most suitable soils and manures; the methods of tillage suited to the crop are also described, including the processes of sowing, irrigating, weeding and harvesting; the diseases and injuries to which the crop is liable are noticed; tables are given showing the cost of production, the average outturn, and the area under cultivation; and finally a summary of the trade of the crop is given. The sections describing the harvesting of the crops are of particular interest. Thus under sugar-cane are described the methods of making *gúrh*, *shakar*, *khánd* and *shirá;* in the chapter on indigo a detailed account of the manufacture of the dye is given; in the chapter on hemp the process of extracting the fibre is described, and so on for all the various crops from tobacco to castor-oil, from millets to melons, and from rice to cucumbers. There is no mention of the nut crops, which are surely common enough to deserve notice, nor is any information given regarding lucerne or the other well known fodder grasses. In the same way no place is given to potatoes, carrots, onions and such like, which may fairly claim to be classed among Field and Garden Crops. It is to be hoped that these omissions will be supplied in a future volume. Enough has been said however to indicate the value of Messrs. Fuller and Duthie's book, and there can be no doubt of its success.

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## ON THE FLORA OF SOUTH TRAVANCORE 1883.

*Extract from Records of the Geological Survey of India, Vol. XVI., Part 1.* By R. Bruce Foote, F.G.S., *Deputy Superintendent Geological Survey of India.*

The most striking feature in the flora of South Travancore is the immense forest of fan palms (*Borassus flabelliformis*) which covers great part of the country. The fan palms, or palmyras, attain here to much greater height than they generally do elsewhere. Trees measuring from 90 to 100 feet in height are not uncommon in places, and, with their stems greatly covered by white, or silvery grey lichens, they present a much finer appearance than the comparatively stunted specimens one is accustomed to see in the Carnatic, or on the Mysore and Deccan plateaux. Whether these Travancore trees owe any part of their greatly superior height to superior age, as compared with

the palms in the great palmyra forest in South Tinnevelly, I could not make out; but the white color of their stems, added to their great height, certainly gives them a more hoary and venerable appearance.

To the westward of the Cooletorary river the palmyra trees are less striking features in the landscape than to the eastward. Cashew nut trees (*Anacardium occidentale*) are very largely cultivated, and attain to greater size than anywhere in the Carnatic. Jack (*Artocarpus integrifolium*) and Alexandrine laurel (*Calophyllum inophyllum*) are also very common trees in South Travancore. Coco and Areca palms are commonly planted in the sides of the numerous little narrow valleys, which score the face of the country, each with a rice flat in the bottom.

The backwaters at the mouths of the several rivers, and the canals connecting them, are often thickly fringed with screw pine (*Pandanus odoratissimus*), and a large fern (*Acrostichum aureum*) (Linn.), is generally very conspicuous among the smaller bushes standing in the shallow water. One of the finest displays of tropical vegetation I am acquainted with in South India may be seen to great advantage by going in a canoe up the Cooletorary river for 3 or 4 miles from its mouth at Tengapatanam (Taingupatnum). The varying effects of dense lofty palm groves, interspersed with large forest trees and fringed with pandanus, &c., along the water's edge, and backed by the beautiful blue outlines of Agastyamalai and other peaks of the Southern Ghâts cannot fail to delight the eye capable of appreciating a series of perfect landscapes. Near the upper end of the navigable reach the beauty of the scene is increased by the presence of great granite gneiss rocks towering up here and there in the forest on either side of the river.

In the foreground of the view from white rock spit (1½ miles north-east from Cape Comorin) the most characteristic trees are umbrella trees (*Acacia planifrons*), the most typical trees of the arid Tinnevelly plains, which are seen across the bay stretching away far to the north-east. A few miles to the west of the Cape these trees become very rare or have disappeared entirely.

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## BOTANIC GARDEN AND PLANTATIONS IN ADELAIDE, SOUTH AUSTRALIA.

We have received a copy of Dr. Shomburgh's Report on the Botanic gardens and plantations in Adelaide.

It is very interesting and well arranged, and illustrated with excellent photographs of the beautiful gardens and buildings. Adelaide has an extreme climate, the summer heat in the shade frequently exceeding 100° in December, January and February; in 1865 the maximum registered being 116° 3′ in the shade.

June, July and August constitute the rainy season, though the rain is uncertain, and hoar frosts often appear at nights, the temperature going down to 28°.

The average rainfall is 21 inches, but during the years 1881 and 1882 the fall has only been 18·19 and 15·74 inches. The drought is prejudicial to European and North American trees, of which the Elm, Plane, Ash, Poplar and Willow thrive, but the Oak, Lime, Birch, Horse Chestnut and Maple do not prosper. All attempts to grow the Beech tree have failed, and the coniferæ generally fail, the Aleppo pine (*Pinus halepensis*) which is indigenous in Cabul, the Cluster pine (*Pinus Pinaster*) and the Stone pine (*Pinus Pinea*) being the only exceptions.

Of the Californian pines, those growing at an altitude of 500 to 1,000 feet do remarkably well, especially *Pinus insignis*, which attains a height of 50 to 60 feet in about 15 years from seed.

Of Indian conifers the Deodar and the Chir (*Pinus longifolia*) alone succeed.

The plants of the Cape of Good Hope flora thrive well in the Adelaide plains, and so do those of South America, the Agave americana blossoming in its 10th to 12th year from seed, and the flower spike attaining a height of 40 feet.

Of the effects of the hot winds we can judge when we read that the flowers and buds are destroyed by moderately hot winds, and dark colored roses in a few hours appear as if a fire had passed over them. To show the effects of these winds we quote as follows :—

"The spring season—the most genial and beautiful in South Australia, I think unsurpassed in any other part of the world, includes the months of September, October and November, the mean temperature during the first two months being from 60° to 70°; at this time trees, shrubs, perennials and annuals emulate each other in regard to their flowers, which are of such a size, richness in color, and perfection as a northern gardener can hardly imagine, but in November the early hot winds destroy their beauties in a few hours."

Grapes grow to a great size, and the hot summer ripens them to perfection, the wine producing 25 to 30 per cent. of alcohol.

The Phylloxera has appeared in the neighbouring colony of Victoria to an alarming extent, and destroyed a good many vineyards.

Regarding the California Phylloxera proof vine, we read as follows :—

"It is found growing uninjured in the midst of vineyards in California which have been destroyed by the Phylloxera, and grows luxuriantly in South Australia, where its grapes make a palatable claret."

Experiments seem to prove that this vine is too robust for the Phylloxera to fasten upon, and Professor Hilyard of the

Californian State University has already reported favorably upon it.

Experiments are also in progress at Montpellier in France as to its qualities.

We wonder if any plants have been secured for our botanic gardens in India ?

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## ANNUAL REPORT ON THE NILGIRI CINCHONA PLANTATIONS FOR 1882-83.

THE Government Cinchona plantations on the Nilgiris are managed by the Madras Forest Department, and during the present year Mr. Gass, Deputy Conservator of Forests, has written the Report, the substance of which proves that the enterprise is on the whole successful, although the past season is spoken of as singularly unfavorable owing to an unprecedented rainfall and severe storms. In consequence of the dying out of old trees of *C. succirubra*, in the Naduvatam plantations, area 318 acres, of which only 150 acres carries mature trees at about 500 to the acre, it is anticipated that the yield will be small until five or six years time, when it is hoped that the vigorous hybrids named *C. magnifolia* and *C. pubescens* will be in splendid condition.

These hybrids show no signs of having suffered from the wind or rain, and are easily distinguished from other varieties by their robust and healthy appearance and by their straight stems.

It is a pity that Mr. Gass has not given the areas of the other estates to which he refers, and a short summary explaining their position and altitude and past history, accompanied perhaps by a sketch map, would make his report much more useful to the general public.

He also states that Dodabetta is too high for the Carthagena variety, but as the altitude is not given, we can draw no conclusions from this assertion. In this plantation, New Zealand flax (*Phormium tenax* we suppose) has been planted out in rows one foot apart on steep places to prevent the soil being washed away, and 13,300 *Eucalyptus globulus* plants have been planted round the boundary of the estates as a protection from the wind, and to serve eventually as fuel.

The Wood and Hooker estates are said to be failures, the latter owing to bad sub-soil, but it is not stated in what way the sub-soil is defective.

Large quantities of manure, both poudrette and cattle shed refuse, have been collected and applied to the trees, and the results will be given in the next report.

A quantity of seed is distributed to the public, the principal demand being for *C. magnifolia*, and largely in excess of the supply.

The crop amounted to about 135,000 lbs., including a balance of 5,300 lbs. over from last year.

It is said to come from four estates Naduvatam, Dodabetta and Hooker and Wood, the two latter being apparently united under the name Pykara, but the reader is left to find out this for himself, if indeed the name Pykara be not that of an entirely distinct plantation not referred to in the general description which precedes the statement of the yield.

We quote as follows regarding the quality of the bark collected :—

"The bark collected was on the whole of an inferior kind, having been taken from dying trees for the most part. It will be observed from Statements Nos. 11 and 12, showing the number of trees decorticated under different systems during the year, that the proportion of green to dry bark is greater than 3 to 1, which is generally speaking the average. The reason for this is that the bark taken from felled trees during the rains got so saturated and unavoidably mixed with mud and foreign matter, which made the weight of the green material higher than it otherwise would have been. It is becoming more and more difficult to procure moss During the year we sustained a heavy loss in grass for covering barked trees, by the road on which a large stack was placed having given way under it during the rains."

The following passage regarding some experiments made in Naduvatam, leaves us quite in the dark as to under which system of barking the trees suffered least.

"*The* 1871 *Coppice, Plot I, Naduvatam.*—Two hundred trees which were cut for the second time in March 1881 made good growth; at the close of the last official year 151 stools had thrown up suckers. The maximum height was 8 feet and girth 5 inches.

"The upper unbarked portions of the stems of trees which had been previously barked in Plot XII were sliced, and 1,900 lbs. of dry bark was obtained. Slicing or scraping was also resorted to in Plot No. XX, and 323 trees previously unbarked were treated in this manner: the yield of bark was 500 lbs. Fifty-one trees were mossed and 239 were grassed, 17 were sliced in strips and not covered at all, while 16 trees treated in the same way were covered. The result of this experiment was most satisfactory. The Head Overseer kept careful notes on the subject, and was able to report that the bark had renewed in about three months, and that the trees looked remarkably well. Some of them should, in my opinion, be barked again this year and the bark analysed, and the difference, if any, between scraped trees, mossed trees, and trees left unmossed, noted.

"*Dodabetta and Wood.*—The 500 trees which were treated under the scraping process in Plots V and XXVIII in 1881-82 are doing well. The bark is well renewed and will be sliced again this year.

"The application of New Zealand flax, as a covering to barked trees, proved a success, and the bark renewed satisfactorily."

In the Madras Government orders we read that the total receipts since the enterprise commenced have been estimated in round numbers at Rs. 33,88,000, and the expenditure Rs. 24,38,000, showing a profit of Rs. 9,50,000. As the date

when the plantations were started is not mentioned, we cannot inform our readers about the average annual profits, and no total area figures are given as we have mentioned before.

Surely considering the importance Cinchona cultivation is now assuming as a flourishing industry in India, we might ask the Government of Madras to furnish clearer reports as to the results of their experiments. What is wanted is to give definite figures showing the cost and yield for given areas of land of certain contour and soil, and this we entirely fail to glean from Mr. Gass' report.

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## THE ASSAM FOREST REPORT FOR 1882-83.

THE Assam Forest Reports are always written in an earnest, enthusiastic style, and the comparatively small scale on which forest work is carried on in Assam,—for although the forest area is large the expenditure is small,—has enabled the Conservator to give fuller details of the forest operations he describes than would be possible in most other provinces without exceeding the customary dimensions of an annual forest report.

The report for the year 1882-83, like those which have preceded it, is an excellent one, and its arrangement, which is in accordance with the recent orders on the subject, is better than in former years. The relegation of statistical information to the appendix, at the Chief Commissioner's suggestion, is an improvement, and several new and most interesting statements are to be found there.

We think, however, that the length of the report might have been curtailed without omitting any really useful information. The annual statements for the most part explain themselves, and the necessity for a detailed explanation in the body of the report of each separate item in these statements seems doubtful.

The repeated allusions to instances of neglect on the part of one or two Divisional officers is also, we think, a mistake. Attention is called to the omissions of one officer in almost every page, and in a style that would lead the reader to suppose that, in Assam, the Conservator has no direct authority over his Assistants.

The year under review which, from a financial point of view, is the best on record, is also the first during which the Divisional officers worked on the new system as Assistants to the Deputy Commissioners in charge of all the forest work in the province. The Conservator has not, however, much to say about this interesting change in the organization. The system "worked smoothly in every respect and simplified the management of forest business greatly;" and it has established a better control over the fellings in the District forests; it is not stated whether the fact that the revenue derived from forest produce removed

by consumers and purchasers increased from Rs. 1,32,649 in 1881-82 to Rs. 2,20,316 in 1882-83 is due to the change or not. The District forests, it is explained, comprise "all unoccupied lands the property of Government on which forest produce grows." These forests are managed by the Mauzadars, (something like Lambardars up-country, but with a group of villages under them for the revenue of which they contract,) in whose mauzas they are situated, who receive a commission of 10 per cent. on collections, and act under the immediate orders of the Divisional Forest officer. Most admirable rules for the collection of this revenue and regulating the relations between the Forest officers and the Mauzadars were sanctioned during the year by the Chief Commissioner, and are published as an appendix to the report.

The permanent establishment was increased during the year, and this facilitated forest work. The Conservator remarks that defective office establishments means that the Divisional officers are tied to their desks, and actual work in the forest proportionately stinted. It would be well if Government realized this fact more fully. At present it frequently happens in most provinces that Divisional officers have to neglect their more important duties in order to do work that could be better performed by a clerk.

During the year great progress was made in demarcation work; 110 square miles added to the reserved forests, and 117 square miles were proposed as reserves. The figures showing the forest waste in each district at the disposal of Government were also revised and increased by 1,480 square miles. This increase (on paper) to the forest area of the province, seems to have vastly impressed the Assam Secretariat, and is loudly trumpeted in the Chief Commissioner's resolution on the report as "a record of a year in which large additions have been made to the area of the department," &c. The forest areas in Assam now stand as follows :—

| Situation of District. | Area reserved. | Area protected. | Unreserved Government land containing forest. | Total forest area. |
|---|---|---|---|---|
| Assam Valley, ... ... | 894 | 492 | 5,236 | 6,622 |
| Hills between Assam and Cachar, ... | 537 | ... | 944 | 1,481 |
| Cachar and Sylhet, ... ... | 745 | 170 | 588 | 1,503 |
| Totals, ... | 2,176 | 662 | 6,768 | 9,606 |

There is, therefore, a very large area of unreserved Government forest still remaining in Assam, but the greater part of this area is situated in one district, Lakhimpur, which is only now being opened out. Besides this the hills on the northern frontier of Assam, at present outside British territory and peopled, where inhabited at all, by independent savage tribes, are all densely wooded; and there is no reason why timber should not be exported from these hills at some future time just as it is exported from Hill States in the Himalayas along the Punjab Frontier.

The forest boundaries in Assam give a great deal of trouble. This must be the case in a climate in which the jungle grows up again almost as soon as it is cut down, and where the boundary lines have therefore to be cleared every year. The system of making use of standing trees with numbered boards let into them as boundary marks, recently described in the "Forester," might, we think, be largely introduced in the Assam forests. At present we believe these forests are demarcated by wooden posts and earthen mounds only.

From the tabular statement given in the Appendix, it appears that there are 725 miles of artificially demarcated boundary lines, or about 1 mile to every 4 square miles of reserved and protected forest. Most of the reserved forests are large areas bounded on two or more sides by rivers or other natural boundaries.

Only 58 offences against the forest law were brought into court during the year. Ten paragraphs of the report are devoted to describing these, but there is nothing particular to note except the small number of offences compared with the large area of the forests. The Assamese ryots have a right, free of charge, to all the forest produce they require for their own use, except a few reserved trees, and the area of the forests and grazing grounds are immensely in excess of the requirements of the population at present.

Fire protection was fairly successful, although it is stated that the year was an unfavourable one. The area attempted was increased by more than 26 per cent. compared with the previous year, and of this area 97,651 acres, 152½ square miles, or about 73 per cent., were successfully protected at a cost of Rs. 8,900; a little under Rs. 59 per square mile.

There is a miscalculation in the average cost of fire protection for the province. The average cost per acre is a little under As. 1-6 instead of As. 3-4 as stated. At this latter rate the cost of the 97,651 acres protected would have been Rs. 20,344. This average for the whole province has been obtained from the sum of the averages in each of the divisions, but as the area in each division is not the same, this is, of course, wrong. Both the result obtained and the cost, even thus corrected, compares unfavourably with many other provinces.

It is stated that "many year's experience has shown that the narrow belts of evergreen trees and scrub along 'jhoras' running through the sál forests are altogether unreliable, in fact useless, to keep fires out." These "jhoras," however, might be made reliable and strengthened as fire lines at a very slight cost by burning along them here and there. We believe that the dry nullahs in the Melghat, which are much less useful for fire protection than the Assam "jhoras," are made use of in this way, and by their help fire lines are made at from two to three rupees a mile and even less.

In provinces where grass is more valuable than in Assam, a reduction in the cost of fire lines is attained by allowing villagers to cut the grass on the fire lines free of charge, and to graze their cattle along the exterior boundaries.

The following recalls our school recollections of the Curfew laws :—

"In the Khasia and Jaintia Hills Division the nature of the forests at Shillong and Riat-kham, all pine, and the carelessness of the inhabitants of these hills, rendered more effective measures than had been adopted in former years necessary."

* * * * *

"The villages adjoining the forest were compelled to clear 25 feet on each side of the village paths leading through the forests, and all grazing and wood cutting were prohibited in the Government forests from the 1st December to the 30th April.

"In addition to this orders were also issued that in the villages bordering on the Government estate to west and south, no fire of any kind should be kindled out of doors between the 1st December and 30th April, without application being first made to, and sanction received from, the Deputy Commissioner or Extra Assistant Commissioner, and without notice being given to the Forester; and that the latter should depute the forest guard nearest to the spot to watch the course of the fire thus kindled."

It is well that the Forester who has to enforce these rules is on the North-east frontier and not on the North-west!

An interesting account is given of the plantation work done during the year in each Division. An addition of 89 acres was made to the India rubber plantation at Charduar, which has now an area of 892 acres, and has cost Rs. 64,351 since it was first started in 1873. The Chief Commissioner wished to stop this experiment some two years ago on the grounds of expense, but he has now consented to allow its being extended by 100 acres annually for the next two years. Rubber trees are found growing naturally along the Assam frontier, but so exceedingly scattered, that it is impossible to protect them from illegal tapping. The plantation was started with a view to stocking completely a compact area that could be properly looked after. These first experiments have, as a

matter of course, cost a good deal of money. Everything had to be learned, as the wildest statements were made, even by recognized authorities, about the growth and yield of the rubber plant. Mr. Mann has all along contended that the tree could be grown in the ordinary way in the ground. But many have held that if so grown it will not yield rubber in sufficient quantities to be profitable. The experiment at Charduar will, before many years, decide this point, as some of the trees are now 10 years old and 50 feet in height. If a good yield of rubber is obtained, the artificial cultivation of the rubber plant will be a most paying investment, besides benefiting enormously the numerous industries in which rubber is used. The present supply is precarious, as it is decreasing every day, and it is well known that the rubber trees are fast disappearing owing to the way they are tapped by the natives.

A most interesting account by Mr. Campbell, Assistant Conservator in charge of the rubber plantation, of the experimental tapping of 50 full grown rubber trees is given in the Appendix. The rubber obtained weighed when dry 214 seers, and sold for Rs. 434. These trees were tapped somewhat lightly so that they might not suffer. It will be interesting to learn whether they recover, and, if so, in what time. If we are not mistaken some trees tapped experimentally in the Bengal forests under Mr. Gamble never recovered. But Mr. Campbell states that some of the trees he tapped had been already tapped 10 or 15 years previously, and that the yield from these was as good as from the previously untapped trees. It is to be hoped that this experiment will be continued, until it has been ascertained at what intervals rubber trees can be tapped without injury and what they yield when treated in this way. The prospects of rubber cultivation depend on the answer.

Practically no timber works were carried on by the Department during the year, and this fact is explained in detail in 16 paragraphs of the report.

The quantity of produce removed by purchasers from the forests is steadily increasing, and its value amounted during the year to Rs. 2,20,316. Besides this, trees valued at Rs. 83,338 were removed free of charge by the Assam Railway Company. Purchasers are now allowed to pay for trees they remove by instalments, the last instalment not being called for until the trees are actually sold to outside traders or removed beyond the authority of the Forest officer. This enables men of small capital to engage in the timber trade, and seems a very practical arrangement. Encouragement of this sort to buyers is not common in the Government service. It is, however, what a private speculator wanting to sell to the best advantage would do. The right to collect rubber in the forests was leased as in the previous year, and brought in over Rs. 32,000. Over 9,000 maunds of rubber were exported from Assam, but

half of this was said to have been brought from beyond our frontier.

The area of forest land allotted for cultivation was 4,246 acres, and Rs. 7,438 were credited to the Forest Department for the trees growing on this land. This is higher than in former years, being about Rs. 1-12-0 per acre, but is of course a very low rate for forest land. This is not, however, a loss but a gain, as the money thus paid is taken from the small capital available for the cultivation and opening out of the country.

"In its financial aspect the year is the most satisfactory hitherto recorded in the history of Assam forestry. Notwithstanding an increase of Rs. 6,500 in charges, the surplus profit in the operations of the year was Rs. 31,364 in excess of the highest surplus hitherto obtained, *viz.*, that of the year 1875-76, when receipts were Rs. 1,07,302 and charges Rs. 61,884."

The Chief Commissioner praises the Conservator highly for his services, and considers that the successful management of the Assam forests is *entirely due* to him.

The Conservator criticises at some length the services of each Divisional officer, a practice we are glad to observe is being abandoned in most Provinces, but is dissatisfied with the work done by the majority. The scarcity of labour in Assam renders it very difficult to carry out operations in the forests; and, perhaps, the unsatisfactory work is also, in part, due to the fact stated in paragraph 3 of the report that "the direction of forest work, down to small details, is *entirely* done by the Conservator." Officers cannot be expected to work well without a feeling of responsibility and a sense of being trusted to stimulate their zeal and spur them to action.

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## PUBLICATIONS AND MAPS RELATING TO FOREST ADMINISTRATION IN INDIA SENT TO THE EDINBURGH INTERNATIONAL FORESTRY EXHIBITION.

We have received the list of admirably selected Publications and Maps relating to Forest Administration in India which have been sent to the Edinburgh International Forestry Exhibition of 1884. The list of books comprises Mr. Brandis' Forest Flora, Mr. Baden-Powell's well known publications, and many others, besides a selection of reports on various subjects by many Forest officers. The maps are mostly those of the Forest Survey, regarding the operations of which a short account is appended to the list which we give in full as likely to interest our readers.

## *Notes on the System of Work adopted in the Forest Survey Department.*

The following extracts from the Annual Progress Report of the Superintendent of Forest Surveys will explain the system adopted when surveying forests in India :—

*General description of the work.*—The work hitherto accomplished by the Forest Survey, differs from that ordinarily undertaken by the Imperial Survey Department, principally in that the ground is mountainous and forest-clad, such as would usually be surveyed by the Topographical Branch on the scale of 1 inch = 1 mile, based as a rule on triangulation only, the detail being sketched on the plane-table; and the scale and system of work adopted by the Forest Survey are more analogous to those employed in the Revenue Branch, which, generally speaking, is engaged in the survey of less rugged and more open country. The most densely-wooded tracts have been selected as forest reserves, and they are usually far from villages, and supplies and carriage are difficult to obtain The survey is made on the comparatively large scale of 4 inches = 1 mile, and, to enable the maps to be fully utilized for the purpose of making valuation surveys and for the computation of the areas of compartments, as well as to enable the densely-wooded ground to be readily recognized from the maps, it is necessary to show many details, such as small ravines and spurs, and to lay them down on the maps with accuracy. The first step is to extend the triangulation previously executed by the Imperial Survey Department, so as to furnish the requisite number of fixed points for work on the larger scale. A network of traverses is then run over the ground, all important roads, paths, and stream beds being measured; the traverses are connected with the trigonometrical stations, and the numerical values of the traverse stations are calculated from them. In the case of plateaux or other level ground, traverses are run across the drainage, so as to give a sufficient number of fixed points for the guidance of the plane-tablers. The plane-table work is based on the trigonometrical and traverse stations. In hilly ground the positions of all important ridges and spurs are fixed by means of plane-table intersections at short intervals, and the beds of all important water-courses are chained, the chaining being connected with the trigonometrical or traverse stations, or with points fixed by intersection on the plane-table. This work is done by Native Sub-Surveyors on pay varying from Rs. 8 to Rs. 31 per mensem, three or four of them working under the direction of a European Surveyor. They then sketch in the ground between the measured elevations and depressions, and it is the business of the European Surveyor to check the accuracy and sufficiency of their measurements, and to complete the sketching in a correct and artistic manner. In order that it may be possible to distinguish at a glance on the field sheets the portions of ground which have been accurately surveyed from those which have merely been sketched, the features which have been laid down by chain measurement or by numerous intersections on the plane-table are shown on the field sheets in a different colour from the rest of the work. It is of great importance to have numerous local names correctly entered on the maps. On each field sheet is pasted a

printed form in which the names within the area surveyed are entered by the plane-tabler both in English and in the Vernacular, reference being made by means of letters to the localities or features of the ground to which they relate. In order to furnish a large number of altitudes which are of so much importance for forest work, numerous observations are made with the aneroid barometer, and a printed form for the entry of the barometrical observations is pasted on to each field sheet. Each plane-tabler is also furnished with a sheet of tracing cloth, on which he records the nature of the forest-growth in such detail as is ordered from time to time. This work occupies a very short time, and, when it is intelligently done, it furnishes a very useful record.

*Method of executing Traverses.*—Last year the method adopted in the preparation of fair drawings was described, and an account will now be given of the manner in which the traverses are executed. The use of the theodolite for traversing has been entirely abandoned, as it has been found that satisfactory results can be obtained with a much simpler instrument, consisting of a plane-table, sight rule and compass, the use of which was originally suggested to Major Bailey by General Walker. A circular card protractor of 12 inches diameter is pinned down on a plane-table; on it is placed a 6 inches magnetic needle, and, to enable objects largely elevated or depressed to be observed, a fine thread is stretched between the central points of the tops of the vanes of the sight rule. The first step is to mark the position of the compass box upon the card protractor in such a manner as to eliminate the angle of variation of the magnetic needle and the angle of convergency between the meridian of the origin of the survey and that of the place where the instrument is being used. This is effected by setting up the table at a trigonometrical station near the main camp, and laying the sight rule across it at the angle of inclination of one of the sides of a triangle, at the apex of which the table stands; the top of the table is then moved round until the sight vane points down the line to the inclination of which the ruler has been laid, and when the compass needle reads zero the position of the compass box is marked on the card. It is manifest that the meridian line of the card protractor will then lie parallel to the meridian of the origin of the survey, and that if the table be set up during the course of a traverse, with the compass box laid against the mark on the card, the same position of the meridian of the card will be maintained, and the readings will all give the inclinations to the meridian of origin which are required for the computations, no angular correction being needed, such as must be applied if a prismatic compass were employed. Should the work extend to a very long distance from the origin, so that the angle of convergency is much increased, it would be necessary to mark a new position for the compass box from time to time, and in any case it is as well to correct the position of the compass now and then, and by observation from a neighbouring trigonometrical station. The instrument is set up over each traverse station, and care is taken that the reading at each end of the diameter along which the ruler lies is the same, for it is then certain that the edge of the ruler passes over the centre of the card protractor. Back and forward readings are taken between each pair of

traverse stations, and thus there is a good check on the record of angular measurements. The instrument is of course more cumbrous than an ordinary prismatic compass, but it has the following advantages over both this and the theodolite. It is much less expensive than the theodolite; it is very strong, and, unless some of the parts are actually broken, it cannot get out of order; while it is at least as quickly set up and used, and the use of it can be very quickly learnt by any Native of ordinary intelligence who can read and record figures. The long needle and large arc, together with the convenience of being able to read at once the angles that are required for the computation, give it a great advantage over the prismatic compass, and the results obtained clearly show this. The arc is graduated to quarter degrees, and if the edge of the ruler lies between two marks its position between them is estimated, and the mean of the back and forward readings is used in the computations. Daily, hourly, or local variations of the magnetic needle are of course to be encountered, but these are common to all instruments in which the magnetic needle is depended on. The distances are measured with chains of different units (Gunter's and 100 feet chains), and the measurements in feet are converted on the spot into links by means of a table, so that any error can be detected and the distance remeasured at once, if necessary. The mean of the two measurements is adopted as the true distance when working out the computations. To obviate errors due to the slope of the ground, a clinometer is used, and the distances are corrected by means of a table before being entered in the computation sheets. The traverses often run over very rough ground, such as the dry stony beds of mountain streams, and the slope is sometimes as much as 30°, but the average hypothenusal correction for last year was only 4·1 per 1,000, the figures for the previous year being 4·7. The following extract from the field book will explain how it is kept:—

| Distances in feet. | Reduction of feet to chains from table. | B—back ray. F—forward ray. | Bearings and mean of distance. | Station numbers. | Distances by Gunter's chain. | Slope. |
|---|---|---|---|---|---|---|
| 186 | 1·51 | B | 21° 08′ | | | |
| | 1·30 | | | | | |
| | 2·81 | | 2·82 | C[22] H.S. | 2·82 | 22° |
| | | F | 201° 00′ | | | |
| 169 | 1·51 | B | 9·30 | | | |
| | 1·05 | | | | | |
| | 2·56 | | 2·57 | 65 | 2·57 | 6° |

| Distances in feet. | Reduction of feet to chains from table. | B—back ray. F—forward ray. | Bearings and mean of distance. | Station numbers. | Distances by Gunter's chain. | Slope. |
|---|---|---|---|---|---|---|
| | | F | 189° 23′ | | | |
| 143 | 1·51 | B | 49 38 | | | |
| | ·65 | | | | | |
| | 2·16 | | 2·15 | 64 | 2·14 | 22° |
| | | F | 229° 45′ | | | |
| 317 | 4·55 | B | 15·30 | | | |
| | ·26 | | | | | |
| | 4·81 | | 4·81 | 63 | 4 81 | 18° |

A further use is made of the instrument above described. Each traverser is furnished with a sheet showing the correct positions, on the scale of 4 inches = 1 mile, of all the trigonometrical stations in the neighbourhood of his work; and, after inspection of existing small scale maps, the lines that he has to traverse are roughly indicated for him on it, and he plots his work on this sheet by drawing the lines each time that he sets up the table. This system has three great advantages:—*1st*, the plot made on the ground is a check against gross error, such as the reversal, the inclination of a line; *2nd*, the traverser can at once see how his work progresses with reference to trigonometrical stations, and can without difficulty connect it with any that he may approach, and make sure that he will be able to close his work on a fixed point; *3rd*, it is easy to indicate to him before he goes out what is required of him. The whole of the traversing is executed on the system above described.

*Method of preparing Fair Drawings.*—The fair sheets are drawn on bank post paper bound at their edges with cloth. Before the sheet is made over to the draughtsman, the graticule is projected by the aid of a brass frame perforated at the proper intervals, and the trigonometrical stations are plotted. In each drawing table is inserted a pane of glass, below which is fixed a tin reflector to throw the light upwards. The table is surrounded on three sides with curtains to keep out light from above. The fair sheet is laid on the table and the field sheets, which are drawn on bank post paper mounted on thin cloth, are passed under it and adjusted over the glass by means of the squares and trigonometrical stations, and the topographical detail is traced in ink directly from the field sheets. The drawing proceeds uninterruptedly, without any intermediate tracing in pencil over an

ordinary tracing glass, without the use of black transfer paper, and without consideration of the position of the names, which are subsequently added in the following manner. A list of all the names which are to appear on the fair sheet is compiled from the field sheets —the names are given. Serial numbers are entered both on the list and in the proper places on a sheet of tracing cloth drawn up to correspond with the fair drawing; and the kind of type to be used is entered on the list opposite each name. The list thus prepared is made over to the type-printer, who sets up each name in succession, and prints it from four to six times on white paper. Several sets of names appear on each sheet of printing paper, the proper serial number being written against each name, and the sheets are then sewn together and handed, with the list and the tracing cloth, to the man who is to attach the names to the fair drawing. This he does after the drawing is quite completed; he selects the best impression of each name, cuts it out, and fastens the slip with gelatine in its proper place. He is guided to the locality by the number on the printing paper and the corresponding number on the tracing cloth, and he selects the exact spot for the name by reference to the field sheet. The edges of the slips are then scraped down, and if they appear too white the drawing is carried over their edges to the required extent. The fair drawing is then ready to be printed. The system here described has been found to answer very well, its great advantages being that while the topographical detail can be copied directly from the field sheet, and that thus small errors of copying which are unavoidable under most other systems are not so readily incurred, the four men—viz., the draughtsman, the list maker, the printer, and the man who attaches the names to the sheet—work quite independently of one another from the beginning to the end of the season, and no one man is delayed by having to wait for the completion of the work of another.

# III. Timber Market.

## MESSRS. MACKENZIE LYALL AND CO.'S LIST OF PRICES CURRENT.

*Moulmein Teak.*

| | | | | | |
|---|---|---|---|---|---|
| Square Timbers, 20 to 30 feet long, 10 to 24 inches square, first class, | Rs. | 105 to 145 | per | ton of | 50 cubic feet. |
| Square Timbers, 20 to 45 feet long, 14 to 18 inches square,... ... | „ | 130 to 200 | „ | „ | „ |
| Second-class Timber, ... ... | „ | 85 to 95 | „ | „ | „ |
| Planks, long lengths, first class, ... | „ | 120 to 145 | „ | „ | „ |
| Furniture Planks, 18 inches and upwards, and 1 inch thick—good,... | „ | 130 to 170 | „ | „ | „ |
| Sheathing Boards, ¾ inch, double,... | „ | 145 to 150 | „ | „ | „ |
| „ „ ¾ inch,... ... | „ | 145 to 170 | „ | „ | „ |
| Scantlings (of sizes), ... ... | „ | 75 to 150 | „ | | |
| Moulmein Cedar square timber, ... | „ | 65 to 70 | „ | | |
| Peemah (*Lagerstræmia flos-reginæ*), ... ... ... ... | „ | 60 to 65 | „ | | |

*American and Colonial Timber.*

| | | | |
|---|---|---|---|
| Mahogany,... ... ... ... | As. | 6 | per supl. foot of 1 inch thick. |
| Ash Oars, ... ... ... ... | „ | 5½ to 6 | per foot. |
| Sál small, } „ large, } ... ... ... | Rs. | 70 to 110 | per ton. |
| Johore Teak Squares, ... ... | „ | 60 to 65 | „ |

Calcutta, *1st March, 1884.*

## MESSRS. CHURCHILL AND SIM'S WOOD CIRCULAR FOR MARCH 1884.

The following quotations are taken from Messrs. Churchill and Sim's Wood Circular, dated London, 4th March :—

East India Teak.—Three cargoes have arrived during the month—two of them by steamships. The demand has been very limited; prices have been maintained at £15 10*s.* to £17 per load, but floating cargoes are not so saleable as previously. The quantity in the public docks is 2,400 loads.

Mahogany.—The operations during the past month have been large, but although the imports were heavy, the auction sales more than kept pace, consequently Importers' stocks do not accumulate. Prices for small and crooked logs show a

further decline, but may now be considered to have reached their minimum; logs from good to large dimensions, straight and sound, rule high with an unabated demand, prices vary from 5*d.* to 8*d.* per foot superficial.

SATINWOOD.—*Porto Rico* and *St. Domingo.*—Supplies of sizeable and figury logs are much wanted, and would sell readily at high prices. *Bahama* and *Jamaica.*—Sound, large-sized wood is the only description asked for. The price of East India Satinwood is quoted at £6 to £8 per ton.

EBONY.—*Ceylon* and *Bombay.*—The stock of good wood is light, and sizeable, sound logs would command improved prices. *Ceylon* £10 to £15 per ton. *Bombay* £8 to £10.

WALNUT WOOD.—*American Black.*—Somewhat heavy arrivals have checked sales, prices for small and inferior logs being chiefly affected: prime, fresh logs of large sizes fairly maintain their value.

BOXWOOD (*Turkey*) is quoted at £5 to £20 per ton.

# IV. Notes, Queries and Extracts.

Jarrah (*Eucalyptus marginata*) Timber.—The following table shows the results of experiments made by the late Captain Ferguson, Harbour Master, Melbourne, on various kinds of timber, specimens of which, and the data, are in the Museum at the University, Melbourne :—

| Locality. | Date when the pile was driven. | Description of Timber. | Depth of water from the bottom surface to high-water mark. | Diameter of pile when drawn. | Present thickness of pile at low water mark. | Destruction of pile by worms. |
|---|---|---|---|---|---|---|
| Sandridge Old Pier, Victoria, | 1852 | Stringy bark | 3 ft. | 7 in. | 5 in. | 2 in. in 8 years |
| Portland Old Jetty „ | 1846 | Do. | 5 „ | 11 „ | 8 „ | 3 in. in 14 „ |
| Warrnambool Old Jetty „ | 1849 | Do. | 11 „ | 9 „ | ... | Eaten through |
| Old Pier, Williamstown „ | 1852 | Blue gum | 4 „ | 11 „ | 9 „ | 2 in. in 8 years |
| Ditto „ | 1855 | Do. | 6 „ | 11 „ | 8 „ | 3 in. in 5 „ |
| Sandridge Old Pier „ | 1854 | Do. | 10 „ | 15 „ | 13 „ | 2 in. in 6 „ |
| Railway Pier „ | 1854 | Do. | 12 „ | 17 „ | 15 „ | 2 in. in 6 „ |
| Sandridge Old Pier „ | 1855 | White gum | 3 „ | 13 „ | 11 „ | 2 in. in 7 „ |
| Sandridge Railway Pier „ | 1854 | Do. | 12 „ | 17 „ | 15 „ | 2 in. in 6 „ |
| Customs Wharf, Geelong „ | 1852 | Do. | 7 „ | 8 „ | 6 „ | 2 in. in 8 „ |
| Old Jetty, Warrnambool „ | 1849 | Blackwood | 11 „ | 9 „ | ... | Eaten through |
| Ditto „ | 1849 | Do. | 11 „ | 9 „ | ... | Eaten through |
| Black Squall, off Williamstown, ... ... ... | 1854 | Teak | 7 „ | Specimens | 4 in. sq. | Riddled |
| Railway Pier, ... ... | 1854 | W.A. Jarrah | 12 „ | 8 in. | 8 in. | Untouched |
| River Wharf, Western Australia, ... ... .. | 1832 | Do. | 5 „ | 10 „ | 10 „ | Untouched |

The following analysis of Jarrah timber, made by Professor Abel, England, and furnished to the Company by the Honourable F. B. Barlee, Colonial Secretary of Western Australia, will show the valuable properties of the timber, which enable it to resist decay, and at the same time form a vegetable poison to insect life :—

"In accordance with instructions received, I have made a qualitative analysis of sundry specimens of the Jarrah, with a view of obtaining from its chemical composition actual proof of the principle which renders the timber impervious to the action of dry rot, and proof against the attacks of the *teredo navalis* and the white ant.

"I find that the duramen contains from 16 to 20 per cent. of an astringent gum, somewhat resembling the gum-kino of commerce, sparingly soluble in alcohol, but completely so in boiling distilled water.

"Upon further analysis, this gum was found to consist almost entirely of colouring matter and a highly astringent vegetable acid, which may be termed 'Jarrah-tannic-acid,' inasmuch as it possesses some of the characteristics of tannic acid, together with other relations peculiar to itself.

"I have failed to discover an alkaloid or organic base (although several different processes have been adopted), since, after the separation of the gum, albumen and colouring matter, I obtain nothing more than traces of saccharose and glucose with fatty matter, which in the present inquiry are of little or no importance. It is therefore evident that the active principle of the Jarrah is the powerfully astringent acid, which, uncombined with any base, is suspended in the gum, and thereby uniformly diffused throughout the tissues of the wood, in a thin section of which innumerable translucent particles of the gum may be seen by the aid of a small convex lens."

The following is an extract from a communication forwarded to India, by H. E. Victor, Esq., C.E., of Perth, in reply to inquiries made by some gentlemen engaged in the carrying out of several large contracts for public works in Scinde, Rajputana, and Central India :—

"Undoubted authority is unanimous in declaring that the timber of the Jarrah under certain conditions is indestructible. His Excellency Governor Weld in a communication to Earl Kimberley on the subject of Jarrah for marine purposes, expresses himself to the same effect, his positive declaration being based on strict inquiry, and the collection of information from all sources likely in any way to set at rest doubt, and to introduce it to the world in its true character. Professor Von Müller, the Government Botanical Director of Victoria, a gentleman well acquainted with the Jarrah, says—"Its wood is indestructible, is attacked neither by chelura, teredo, nor termites, and is therefore so much sought for jetties and other structures exposed to sea water. Vessels built with this timber have been enabled to do away with all copper plating. It is very strong, of a close grain, slightly oily, and resinous in its nature, works well, takes a fine finish, and is by shipbuilders in Melbourne considered superior to oak, teak, or any other wood for their purpose." The Committee of Lloyd's, under the

authority of their Secretary, after the representations of his Excellency Governor Weld, informed the Earl of Kimberley that they had determined to rank this timber with those named in line No. 3, Table A, attached to the Societies' rules for the construction and classification of ships.

"Among the facts arrived at by the Government of Western Australia, in submitting this timber for acknowledgment at Lloyd's, are several of a very interesting and valuable character. The Imperial Government Clerk of Works at Fremantle, speaking from twenty years' experience and use of considerable quantities of this timber, says:—'It is remarkably free from the action of nearly all the ordinary forms of decay incidental to woods in contact with or buried under ground, under water, at mortises or other joinings, in piles in sea jetties, and in planking sea-going vessels, without sheathing or other protection, it has proved sound and enduring to an extent which appears to denote exemption from decay, so far as evidence can be derived from observation on timber exposed for upwards of thirty years. I have recently taken up piles that were driven for a whaling jetty in the year 1834 or 1835, making a period of at least thirty-five years; the timber is small, but perfectly sound and free from insects, although the place is swarming with teredo.'

"I am well aware of the fact that the forests of India cannot supply the gradually increasing demand for sleepers, and hardly sufficient for renewals on the lines already constructed. With the present high price of iron, at which it is likely to stand for some time, the adoption of iron-pot sleepers would seriously affect the first cost of the proposed new lines; so they must, for a time at least, be left out of the estimates. Under the circumstances, I believe it worthy the consideration of the Government of India the establishment of an agency at Fremantle, under the direction and supervision of a qualified engineer officer, whose duties it would be to correspond with the local representatives of the timber trade, arrange for contracts, see that all orders were fully up to specification in quantity and quality, to gradually collect a stock of scantlings most in demand on the works, certify and brand every piece of timber before shipment, seeing it was properly seasoned, and arranging for its despatch to India. The saving on such a system would be enormous, directly as well as indirectly. The cost for the construction of storage, godowns, and yards would not exceed Rs. 50,000; floating stock, value about Rs. 150,000; and expenses of agency not more than Rs. 20,000 rupees per annum; the quantity annually despatched being up to a million narrow gauge sleepers, and the same number of cubic feet of timber of all sizes, of the local value of say £100,000.

"The purposes to which Jarrah timber may be applied are innumerable: it fills the place where sál and teak could not be

admitted, as well as where they are used ; and as the material can be supplied at a price somewhat less than the timbers named, in the log, and at half their price in scantling, it should be employed where hitherto timber has been considered undesirable—for instance, in sea-facing, dock-lining, landing-stages, break-waters, and beacons ; kerbs, road-paving, block-flooring, weather-boarding, and wainscot-partitions ; wallings, ceilings, and roof-coverings. As a substitute for the roofing usually constructed in India, I believe shingling with Jarrah only requires to be known to be appreciated. At a distance these shingles might be mistaken for grey slates, they lie so close and regularly ; thin as they are, they make a remarkably cool roof, and when once set require little or no repairs for years. I have seen here, where many roofs are of this material, houses that have not cost £1 in roof repairs for twenty-five years. They are water-tight in the heaviest downpour, and are not shifted in a hurricane. Their lightness admits of a considerable saving in the roof framing. The saw bench room at the Rockingham mills is 32 feet span. The heaviest timbers are only 6′ × 2, the rafters 18 inches apart, and the principals 6 feet. With all these advantages shingles do not readily catch fire : burning charcoal thrown on them chars a hole, but does not flame them. It is one of the most uninflammable timbers I am acquainted with. The shingles, as supplied from the mills, are 24″ × 4″ × ¼″, weight less than 1 lb. each, are laid with an overlap of 16 inches, run about 450 to a square, are hung with French wire nails on sawn battens, the pitch of the roof being 45 degrees. I would strongly recommend that they receive a fair trial, as I feel sure they would become popular."—*Timber Trades Journal.*

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General Meeting of Agricultural and Horticultural Society of India.—The following extracts from the report of the ordinary General Meeting of the Agricultural and Horticultural Society of India will be found interesting to our readers :—

*Marsdenia tenacissima.*—Capt. Pogson, writing from Dehra Dún on the 29th January, says—"I have the pleasure to forward sample of a valuable fibre, the produce of a creeping plant which grows in the Terai forests of the Dún. The Goorkhas, who are much given to shooting and fishing, make their fishing lines with this fibre, a pretty good proof of its strength." Capt. Pogson further kindly promises to try and obtain seeds and plants of the creeper for the Society. The Secretary stated that this fibre (*Marsdenia tenacissima*) attracted the attention of the Society as far back as 1844, and in the Journal for that year a report of trials made with it, amongst other fibres, may be found.

*The late Rev. T. A. C. Firminger.*—At the Council Meeting held this day, the President announced the death of an old and valued member of the Society, the Rev. T. A. C. Firminger, M.A., Honorary Member of the Agri-Horticultural Society of India, and of the Punjab. He was elected a Member in 1851, and an Monorary Member in 1868. His "Manual of Gardening for Bengal and Upper India," which has been through three editions, and is deservedly the most popular book on Indian Gardening, has made his name familiar to almost every European in India. He died on the 18th January, aged 72, at Warren Lodge, Edmonton.

*Silos in Bengal.*—A sample of Ensilage made by Dr. Greenhill at his farm in Darjeeling strongly attracted the attention of the members present, the sample was mostly made up of *Reana luxurians*, a fodder plant native of Guatemala, introduced by the Society in 1877. This grass, which is extremely succulent and juicy, has preserved its properties in the silo, and after four months from the date of being cut, appears as palatable as the freshly cut grass to cattle.

Dr. Greenhill's silo, though so efficacious, was an extremely simple and inexpensive one. A disused hut was unroofed, its walls carefully plastered or "lipo'd" and was a ready made silo to hand. 400 maunds of green fodder were filled in; about 200 maunds being first put in, well trampled and heavily weighted on the top, and in a few days the contents had settled down to about half its original height, the silo was then opened, another 200 maunds filled in, and again heavily weighted; a thick layer of earth "lipo'd" over, keeping the Ensilage air-tight. As stated above the silo was then left for four months, and on its being opened for use, all but a very small quantity was found in a thoroughly sound condition, the little that there was damaged was due to some slight obstruction having met a corner board and thus preventing its settling down. The great success that has met Dr. Greenhill's first trial has encouraged him to make a much larger silo for next season.

A silo made by General Wilkinson at Fort William was also an unqualified success. General Wilkinson's memo. is transferred to the Journal, as it is considered desirable to place on record for future reference all facts connected with what may be termed the pioneer Silos of Bengal, if not of India. Great hopes may be entertained of silos and Ensilage solving the difficulty which have hitherto met all attempts to reform Indian Agriculture at the outset, *viz.*, the poverty of the cattle.

A large and handsome portfolio, containing the Forest Flora of South Australia, in three parts, by J. E. Brown, F.L.S., presented by H. E. Scott, Esq., Commissioner for South Australia, Calcutta International Exhibition. This very hand-

some presentation was much admired ; the illustrations are full size and beautifully tinted. The best thanks of the Society was voted to the donor.

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THE WALNUT.*—The walnut is a tree that may be considered as one producing fancy wood, it being mostly used by cabinet-makers. The supply of walnut is certainly very limited ; it is only procured in small lots at a time, and is found growing all over the country. It is usually obtained mixed up with other kinds of timber, but it is very difficult to get it free from shakes, which make the timber practically of no use. Amongst a dozen trees it very often happens that not more than one may be of real use, which makes the wood very valuable, although it may have been bought at a very low price. The timber from America has largely taken the place of our home-grown trees, and the foreign importations are very often superior in point of quality.

Although it does not attain a great height, it sometimes grows to a prodigious size. There is often much difficulty experienced in the measuring of this tree, as it is often badly shaped in its growth, owing to its large boughs. The colour of the heartwood is dark, and is much prized by the cabinet-maker for fancy work. It is hard, and is one of the most durable of our home-grown timbers. It is nevertheless a wood that is easily worked. It is well to have those trees that are free from shakes cut up into boards from half an inch and upwards ; and, although it is not procured in long lengths, this is very little objection, as for cabinet work lengths do not much matter. Although foreign fancy woods have taken the place, to a considerable extent, of our walnut, it is still a popular wood, and walnut furniture is much valued. It is a wood that takes a long time to season, but when thoroughly dry is not liable to shrink or warp by heat or moisture. It has also this property, that it will not corrode iron when in contact with it, as oak and some other hardwoods do.

One of the most important outlets for walnut, in addition to cabinet-making, is for the purpose of making gun-stocks. It is the favourite wood for this work, and large quantities of it are consumed in the gun manufacturing towns. The sapwood, which is easily distinguished by its whiteness, is quite valueless, as it very speedily goes to decay, and for a fine vein or figure the nearer the root the better. The walnut does not now occupy the position as a timber that it used to do in former times, and it is not sought after to any great extent by the timber merchant ; it does not, therefore, receive great attention generally in the saw-

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* As the walnut is common in the Hill Forests of Northern India, we give the notes regarding it from the papers on the Conversion of English Timber in the "Timber Trades Journal."—[ED.]

mill, and although for good boards a high price can be obtained from the cabinet-makers, it is frequently a source of loss, so rare are trees of any size found free from shakes, in which case it has to be cut up and sold as slabs. In addition to its liability to shakes, it sometimes opens out very inferior in the heart, although externally looking sound; especially is this the case with old trees, they often being found decayed and unfit for use.

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DURABILITY OF TIMBER.—Beneath the foundation of Savoy Place, London, oak, elm, beech and chestnut piles and planks were found in a state of perfect preservation, after having been there for 650 years. While taking down the old walls of Tunbridge Castle, Kent, there was found in the middle of a thick stone wall a timber curve, which had been enclosed for 700 years. Some timber of an old bridge was discovered while digging for the foundations of a house at Ditton Park, Windsor, which ancient records incline us to believe were placed there prior to the year 1396. The durability of timber out of ground is even greater still. The roof of the basilica of St. Paul, at Rome, was framed in the year 818; and now, after more than a thousand years, it is still sound, and the original cypress wood doors of the same building were in use more than 600 years.—*Timber Trades Journal.*

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THE INTERNATIONAL FORESTRY EXHIBITION.—The committee are now in possession of the details of the contributions they may expect to receive from India. The general Government collection will embrace first a series of forest maps, prepared at the Forest School at Dehra Dún, which show the progress that has been made in the last fifteen years in the demarcation of forest reserves, and surveys of the Himalayan and other hill tracts; secondly, an index collection of 800 varieties of the different timber trees found in India. Besides this each Local Government will contribute any remarkable forest products peculiar to their respective provinces. From the Exhibition which is to be held in Travancore in April, His Highness the Maharajah proposes to pass on the collections specially pertaining to forestry. There are many specimens of Indian furniture and carved wood in this country, which the owners have intimated their willingness to send for the purposes of the Exhibition, and the planters of tea, coffee, cocoa, cinchona, &c., in India and Ceylon, propose to send samples of the produce of their estates. By these combined efforts, we may expect that the Indian Court, the charge of which has been entrusted to a special Commissioner, will contain a fitting representative collection of the forest wealth of our Eastern Empire.—*Timber Trades Journal.*

# V. Extracts from Official Gazettes.

1.—Gazette of India—

No. 183.—*The 25th March, 1884.*—Consequent on the retirement from the service of *Mr. M. J. Slym*, Deputy Conservator of Forests of the 1st grade in British Burma, *Mr. C. J. Ponsonby*, Deputy Conservator of the 2nd grade in the North-Western Provinces and Oudh, and officiating in the 1st grade of Deputy Conservators, is confirmed in the latter appointment, with effect from the 16th December, 1883.

2.—Calcutta Gazette—

*The 3rd March, 1884.*—*Mr. C. G. D. Fordyce*, Assistant Conservator of Forests of the 3rd grade, is promoted to the 2nd grade of Assistant Conservators, with effect from the 5th November, 1883.

*The 4th March, 1884.*—*Mr. A. R. Grant*, Deputy Conservator of Forests, Teesta Division, is allowed leave of absence for six months, without allowances, with effect from the 21st April, 1884.

*Mr. W. Johnston*, Assistant Conservator of Forests, will take charge of the Teesta Division on return from furlough.

*The 12th March, 1884.*—In modification of the previous notification of the 4th instant, *Mr. A. R. Grant*, Deputy Conservator of Forests, Teesta Division, is allowed special leave of absence for five months, with effect from the 1st June, 1884.

*Mr. A. L. Home*, Conservator of Forests, Bengal, will take charge of the Teesta Division, in addition to his own duties, during the absence, on leave, of *Mr. A. R. Grant*, or until further orders.

3.—North-Western Provinces Gazette—

No. $\frac{9}{19-1\text{-}II}$.—*The 7th March, 1884.*—*Mr. S. Eardley-Wilmot*, Deputy Conservator of Forests, is appointed to the charge of the Kumaun Forest Division, with effect from the forenoon of the 6th November, 1883.

No. $\frac{26F}{16-1\text{-}II}$.—*The* $\frac{14th}{17th}$ *March, 1884.*—*Mr. W. R. J. Brereton*, Deputy Conservator of Forests, having reported his return to duty on the forenoon of the 31st December, 1883, was placed on special duty in connection with boundary work of the Garhwál Division from that date to the 12th February, 1884, inclusive.

No. $\frac{38F}{45-1-V}$.—*The* $\frac{17th}{18th}$ *March, 1884.*—With effect from the 8th January, 1884, the date on which *Mr. Reynolds* took charge of his office of Deputy Superintendent, Forest Surveys, *Mr. E. F. Litchfield* to revert to his substantive appointment as Assistant Conservator, 1st grade.

No. $\frac{60F}{21-IV}$.—*The* $\frac{25th}{26th}$ *March, 1884.—Mr. F. B. Bryant*, Assistant Conservator, 3rd grade, to be Assistant Conservator, 1st grade, with effect from the 15th October, 1883, the date on which he passed the higher standard in Urdu and Hindi.

4.—Punjab Gazette—

No. 110.—*The 5th March, 1884.*—From Punjab Government Notification No. 87, dated 16th February, 1884, ordering the promotion of *Mr. J. H. Lace*, to Assistant Conservator, 1st grade, strike out the words "sub *pro. tem.*"

*Mr. Lace* is confirmed in that grade with effect from the 10th November, 1883.

No. 129.—*The 12th March, 1884.—Mr. J. H. Lace*, Assistant Conservator, is appointed to the charge of the Gujránwála Division, which he received over on the forenoon of the 2nd February, 1884, from *Mr. A. E. Wild*, appointed Officiating Conservator of Forests.

No. 131.—With reference to Government of India Notification No. 144F., dated 29th February, 1884, appointing *Mr. A. E. Wild*, Deputy Conservator of Forests, 3rd grade, to officiate as Conservator of Forests, Punjab, during the absence on privilege leave of *Mr. B. Ribbentrop*, His Honor the Lieutenant-Governor has been pleased to make the following officiating promotions during *Mr. Ribbentrop's* absence with effect from 5th February, 1884:—

*Mr. W. Shakespear*, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

*Mr. A. E. Down*, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

*Mr. E. S. Carr*, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

5.—Central Provinces Gazette—

No. 1048.—*Mahomed Ghouse*, Sub-Assistant Conservator of Forests, on probation, is confirmed in his present appointment, with effect from the 1st January last, to fill an existing vacancy.

No. 1485.—*The 26th March, 1884.—Mr. M. S. Fowler*, Assistant Conservator of Forests, attached to the Direction Division, is temporarily transferred to the Chanda Division.

*Mr. M. S. Fowler* relinquished charge of his duties in the Direction Division on the forenoon of the 1st March, 1884, and reported his arrival at Chanda on the afternoon of the 3rd idem.

6.—British Burma Gazette—

No. 6.—*The 21st February, 1884.*—Consequent on the retirement of *Mr. M. J. Slym*, Deputy Conservator of Forests, 1st grade, the following promotions are made in the British Burma Forest Department, with effect from the 16th December, 1883—

*Captain C. T. Bingham*, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade.

*Mr. P. J. Carter*, Deputy Conservator, 4th (officiating 3rd) grade, to be confirmed as Deputy Conservator, 3rd grade.

*Mr. T. H. Aplin*, Assistant Conservator, 1st (officiating Deputy Conservator, 4th) grade, to be confirmed as Deputy Conservator, 4th grade.

*Mr. J. W. Oliver*, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

*Mr. C. W. Palmer*, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

*Mr. H. B. Ward*, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

7.—Assam Gazette—

No. 69.—*The 12th March, 1884.*—The following Notification is re-published from the *Calcutta Gazette* of the 5th March, 1884—

*The 3rd March, 1884.—Mr. C. G. D. Fordyce*, Assistant Conservator of Forests of the 3rd grade, is promoted to the 2nd grade of Assistant Conservators, with effect from the 5th November, 1883.

8.—Mysore Gazette—

*Nil.*

9.—Madras Gazette—

*The 25th February, 1884.—Mr. W. C. Wouterez*, Forest Ranger, 4th grade, Trichinopoly, has passed the Language Test in Tamil.

No. 30.—*The 4th March, 1884.—Mr. A. W. B. Higgens*, Deputy Conservator of Forests, 1st grade, Cuddapah, three months' privilege leave, from or after the 25th instant, under Section 73 of the Civil Leave Code.

No. 32.—*Mr. G. Homfray*, Assistant Conservator of Forests, 3rd grade, to act as District Forest Officer, Cuddapah, during the absence of *Mr. Higgens* on privilege leave, or until further orders.

No. 33.—*The 3rd March, 1884.—Mr. H. J. A. Porter*, Assistant Conservator of Forests, 3rd grade, has passed by the Lower Standard in Tamil.

No. 37.—*The 13th March, 1884.—Messrs. T. P. Peake* and *F. A. Lodge*, Forest Officers appointed by the Secretary of State, having reported their arrival on the afternoon of the 20th December, 1883, are brought on the strength of the Madras Forest establishment from that date.

*The 14th March, 1884.—G. Arulánantham Pillai*, Forester, 2nd grade, to act as Forest Ranger, 5th grade, in the Tinnevelly District during the absence of Ranger *A. S. Maria Pragásam Pillai.*

No. 40.—*The 25th March, 1884.—Mr. W. C. Hayne*, Deputy Conservator of Forests, 3rd grade, and District Forest Officer, Tinnevelly, one year's furlough, with the usual subsidiary leave, from or after the 15th April next, under Section 49 of the Civil Leave Code, 5th Edition.

No. 44.—*Mr. H. J. A. Porter*, Assistant Conservator of Forests, 3rd grade, to be Assistant Conservator of Forests, 2nd grade, with effect from the 24th January, 1884, and District Forest Officer, South Coimbatore Division.

No. 45.—*T. Muhammad 'Ali Sahib Bahadur*, Sub-Assistant Conservator, 1st grade, to be District Forest Officer, Chingleput.

No. 46.—*Mr. C. E. Brasier*, Assistant Conservator, 3rd grade, to act as District Forest Officer, Tinnevelly, during the absence of *Mr. W. C. Hayne*, Deputy Conservator of Forests, 3rd grade, or until further orders—to join on relief by *Muhammad 'Ali Sahib Bahadur.*

10.—Bombay Gazette—

*Extract from Circular No. 6, dated 17th March, 1884.*—It has been decided to introduce the Government of India Forest Department Code into this Presidency with effect from the 1st April, 1884.

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